INDIA RUBBER WORLD

OUR 63rd YEAR

A BILL BROTHERS PUBLICATION

MAY, 1952

DU PONT NBC

RETARDS EXPOSURE CRACKING OF GR-S

Now it's possible to improve the quality of GR-S compounds by addition of Du Pont NBC. This valuable compounding ingredient retards both dynamic and static exposure cracking. Its effectiveness has been demonstrated in outdoor exposure tests in Florida where a stock containing 2 parts of NBC showed no cracking after 56 days of flexing. The control with no NBC had begun to crack after only two days.

IMPROVES HEAT RESISTANCE OF NEOPRENE

In neoprene stocks, exposure cracking isn't a problem but Du Pont NBC will improve heat resistance. Neoprene compounds containing NBC show exceptionally good resistance to embrittlement during continuous service at temperatures between 250°F. and 300°F.

INHIBITS SUNLIGHT DISCOLORATION OF NEOPRENE

Du Pont NBC has proved very useful in retarding sunlight discoloration of colored neoprene compounds. A control sample showed substantial discoloration after 3 months' exposure to indirect sunlight. Other samples with only 0.5 part of NBC added did not discolor.

While Du Pont NBC broadens the usefulness of GR-S and neoprene compounds, it has an adverse effect on the aging of natural rubber. Consequently, NBC should not be used in rubber compounds or in stocks which will be in contact with rubber.

If you have not yet investigated the use of Du Pont NBC in neoprene and GR-S, it will pay you to do so. Complete information is contained in Report No. 49-1. Extra copies are available if you've misplaced yours. And we'll be pleased to send samples of Du Pont NBC. Call your local Rubber Chemicals representative or write:

E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington 98, Delaware.

BRANCH OFFICES:

Akron, Ohio	40 E. Buchtel Ave.	HEmlock 3161
Boston, Mass.	140 Federal St.	HAncock 6-1711
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Los Angeles, Cal.	845 E. 60th St.	ADams 3-5206
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DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

DU PONT

150th Anniversary

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

INDIA RUBBER WORLD, May, 1952, Vol. 126, No. 2. Published Monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $5.00 per year. Canada $6.00; All Other Countries $7.00; Single Copies 50 Cents. Address Mail to N.Y. Office.

For happy days use **Philblack* A**

Easy processing . . . all the way!

● "Nervy" rubber compounds getting on *your* nerves? Consult your Philblack technical sales representative. See how easy it is to cure processing headaches (and cure rubber compounds!) with Philblack A.

This easy-going black penetrates GR-S and reclaimed rubber particles . . . *fast!* Presto! You get really homogeneous, uniform mixtures with remarkably good extrusion qualities.

Try Philblack A wherever you need smooth, glossy surfaces, truly accurate moldings, pliancy, suppleness and general good looks! Depend on Philblack A also to reduce heat build-up in heavy duty tires and tubes. Philblack A is shipped in bags or bulk . . . for use in natural, synthetic or cold rubber.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING · AKRON 8, OHIO

PHILBLACK EXPORT SALES DIVISION · 80 BROADWAY · NEW YORK 5, N. Y.

Phillips 66

* A Trademark

Philblack A and Philblack O are manufactured at Borger, Texas. Warehouses in Akron, Boston, Chicago and Trenton.
West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

How much heat can Rubber Take?

Plenty —when Naugatuck's Aminox® is on the job! This proven antioxidant for natural, general purpose, or special synthetic rubbers gives excellent protection against rubber's two greatest enemies, heat and oxygen aging.

Aminox is especially recommended for tubes, tire carcass, footwear, belt frictions, or wherever "the heat is on" your rubber products. For free samples and full technical data, send the coupon today.

PROCESS • ACCELERATE • PROTECT WITH NAUGATUCK CHEMICALS

Typical Protection Data
(Heat-resistant Neoprene Compound)

Against Heat
(6 days at 250° F in Air)

	Blank	Plus 2% Aminox
Percent tensile retained	79.2	92.6
Percent elongation retained	21.9	36.4

Against Oxidation
(13 days in Oxygen Bomb at 80° C—300 p. s. i.)

	Blank	Plus 2% Aminox
Percent tensile retained	59.8	73.4
Percent elongation retained	34.1	62.4

Naugatuck Aminox

Naugatuck Chemical, Division of United States Rubber Company
NAUGATUCK, CONNECTICUT

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Co., Ltd., Elmira, Ont.

Rubber Chemicals • Aromatics • Synthetic Rubber • Plastics
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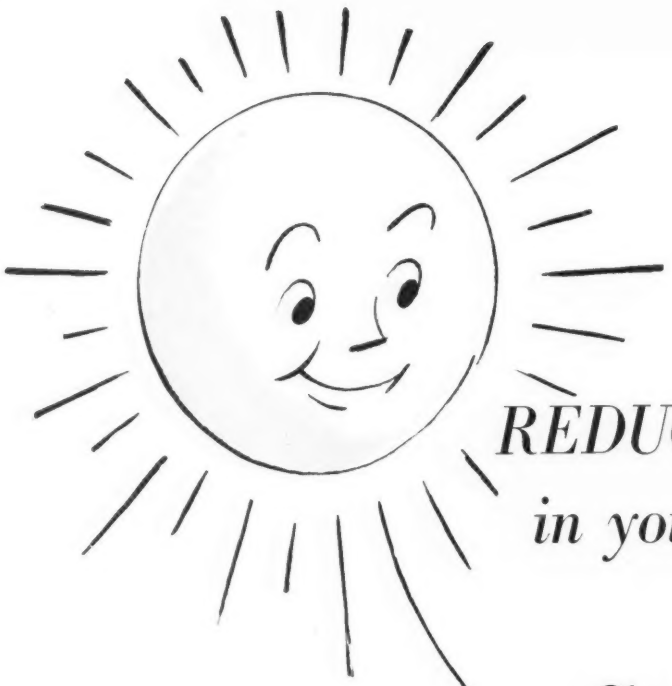
Naugatuck Chemical, 135 Elm St., Naugatuck, Conn.
Please send me, without charge, experimental samples and technical data on Aminox.

Name..... Title.....
Company.....
Address.....
City..... Zone.... State.....



How to REDUCE BLISTERING in your tile processing with

SOLKA®-FLOC

It's an easy job. Just use 20 volumes of SOLKA-FLOC to replace an equal volume of mineral filler. In addition to reduced blistering you'll get harder, smoother surfaces . . . sharper designs . . . controlled shrinkage . . . reduced nerve . . . easier processing.

SOLKA-FLOC, a highly purified cellulose, has found wide application in the rubber field. In fact, it has proved to be such a valuable processing aid in the manufacture of such products as tiling, soling, matting, molded goods, extruded goods, etc., that *Brown Company has doubled its production of SOLKA-FLOC.*

Why not find out more about its use in processing? It could mean a better product, bigger profits for you. Write Technical Service, Dept. DF5, at Boston, for recommendations and samples.

BROWN QUALITY COMPANY, Berlin, New Hampshire
CORPORATION, La Tuque, Quebec

General Sales Offices: 150 Causeway St., Boston 14, Mass.—Dominion Square Bldg., Montreal, Quebec

SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWLS
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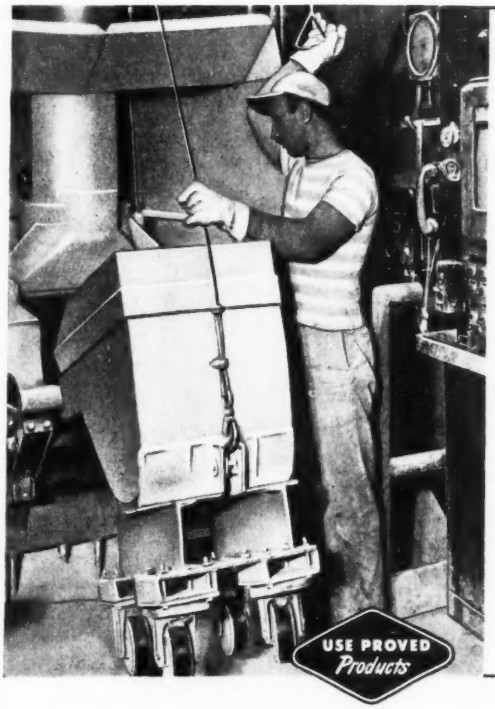
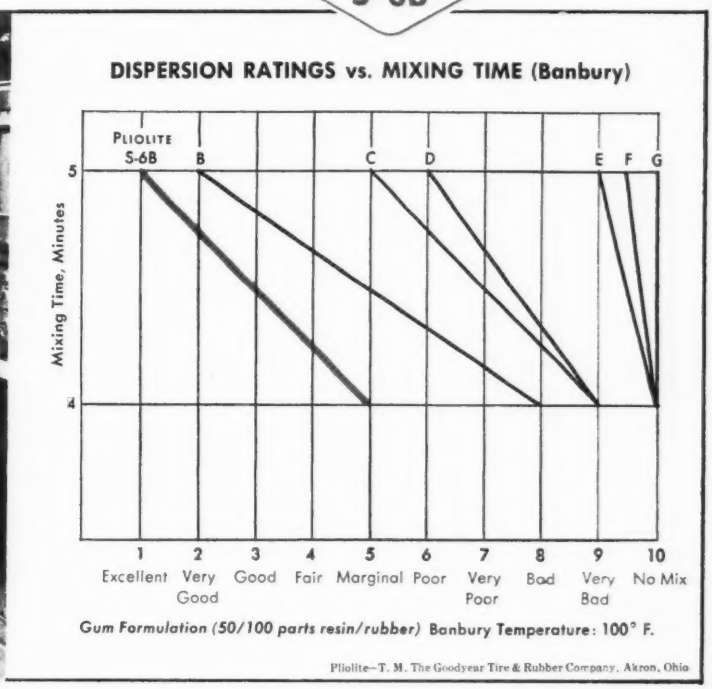
MORE PRODUCTION FROM SAME BANBURY

with PLIOLITE S-6B





TESTED against six competitive rubber reinforcing resins, Goodyear's PLIOLITE S-6B gave higher Banbury production in obtaining marginal to excellent dispersions.

Reason for this increase is the superior ease of dispersion possible with PLIOLITE S-6B – and resultant easier mixing, faster mixing and consequent increased production capacity from existing equipment.

PLIOLITE S-6B added to rubber stocks gives you other benefits too – increased hardness, increased stiffness, increased flex-life, increased abrasion resistance, increased tear resistance.

Preferred 6-to-1 over other resins by rubber compounders, PLIOLITE S-6B has become "The Best Known–Known as the Best" among rubber reinforcing resins. See a Chemical Division Representative for details, or write:

Goodyear, Chemical Division
Akron 16, Ohio

GOODYEAR

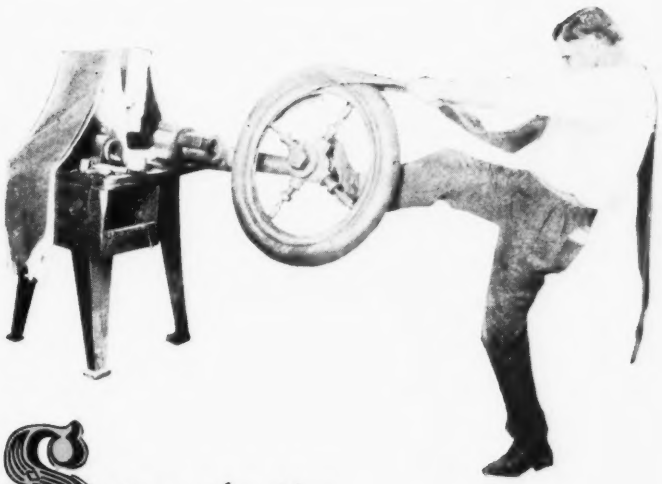
THE FINEST CHEMICALS FOR INDUSTRY

RE

AQUEOUS SUSPENSIONS OF ULTRA ACCELERATORS

RE

RLD



Since the time tires were made like this . . .

Muehlstein has maintained—as it does today—a leading position in serving the rubber and allied industries.

H. MUEHLSTEIN & CO. INC.

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BRANCH OFFICES: Akron • Chicago • Boston • Los Angeles • Memphis

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CRUDE RUBBER · SYNTHETIC RUBBER · SCRAP RUBBER · HARD RUBBER DUST · PLASTIC SCRAP

applications of

VELSICOL RESINS

FOR RUBBER COMPOUNDING

GE-9—AB11-4—AB11-2

some suggested applications:

- MECHANICAL GOODS
- ELECTRICAL INSULATION COMPOUNDS
- RUBBER SHOE SOLES AND HEELS
- RUBBER FLOOR TILING
- GASKETS AND JAR RINGS
- RUBBER ADHESIVES AND CEMENTS
- MOLDED RUBBER PRODUCTS
- TUBULAR COMPOUNDS
- RECLAIMED RUBBER
- SHEETING
- COLORED RUBBER STOCKS
- BATTERY CASES
- HARD RUBBER COMPOUNDS

features:

1. THERMOPLASTIC HYDROCARBON RESINS.
2. COMPATIBLE WITH NATURAL AND SYNTHETIC RUBBERS.
3. EFFECTIVE PLASTICIZERS AND SOFTENERS... in highly-loaded clay stocks or in recipes incorporating carbon black.
4. MILL READILY.
5. EXCELLENT DISPERSING AGENTS FOR FILLERS AND PIGMENTS.
6. FACILITATE PROCESSING PROCEDURES . . . impart excellent milling, calendering processing and tubing characteristics to stocks.
7. IMPART EXCELLENT PERFORMANCE CHARACTERISTICS . . . such as good tensile strength, elongation and modulus, as well as good resistance to abrasion and aging.
8. POSSESS HIGH ELECTRICAL RESISTANCE PROPERTIES.
9. AID IN THE DEVELOPMENT OF NON-SCORCHY STOCKS... without excessive retardation of cure at high temperatures.

For additional information concerning properties and applications of Velsicol Resins, write:

VELSICOL CORPORATION

GENERAL OFFICES AND LABORATORIES
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NEW YORK, N. Y.

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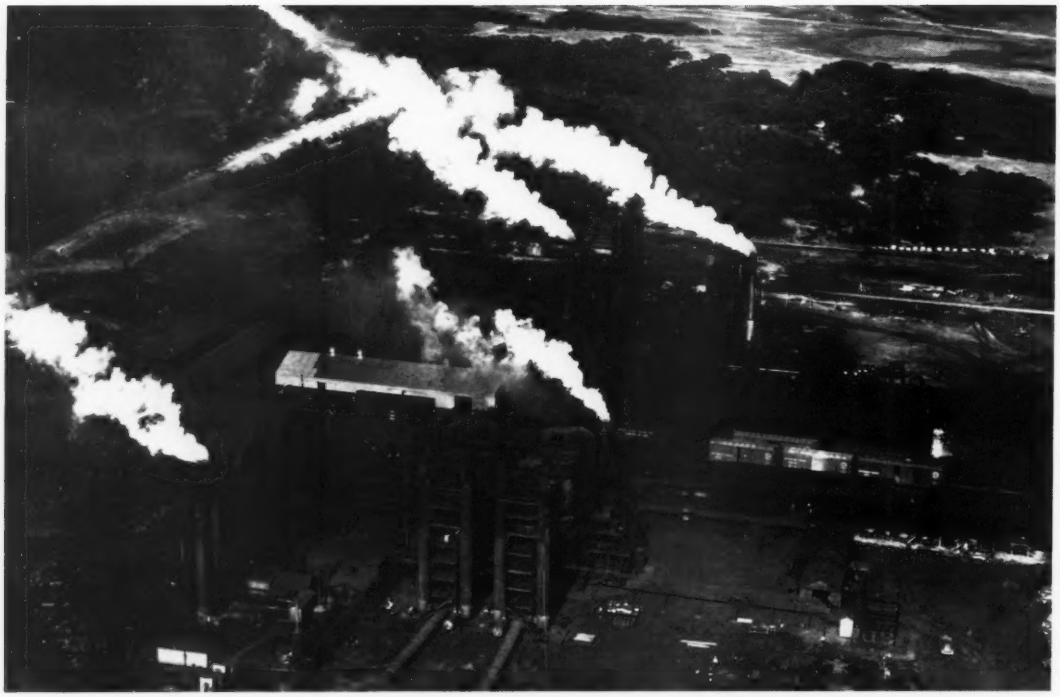


AERIAL VIEW OF THE COMPANY'S CARBON BLACK FURNACE PROCESS PLANTS AT ARANSAS PASS, TEXAS

KOSMOS 50

Kosmos 50, a quality furnace black (FEF) with superb processing characteristics and outstanding reinforcement, is continuously being used by discerning compounders with gratifying results in a variety of stocks.

There are no problems with United Blacks.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

NEW YORK • AKRON • CHICAGO • BOSTON

CANADA: CANADIAN INDUSTRIES, LIMITED

Shoes by Arrow Handicraft Mfg. Co., Chicago, made with soles by Rubber Engineering and Chemical Company, Lake Zurich, Ill.

Wyandotte Purecal makes this smart idea practical!

Provides hot tear resistance in GR-S stocks, ups production, cuts costs.

You can make your own moccasins! Yes, you can assemble this smart pair of sports shoes yourself — even your children can do it — from the convenient Arrow Handicraft kit, shown above. Actually, it's simple, easy, and loads of fun. Try it!

There is a story behind this ingenious idea. It starts with the rubber sole. Before using Wyandotte PURECAL*, these soles were difficult to get off the mold. There was considerable tearing around the small holes and many rejects resulted. A Wyandotte representative was called in to investigate.

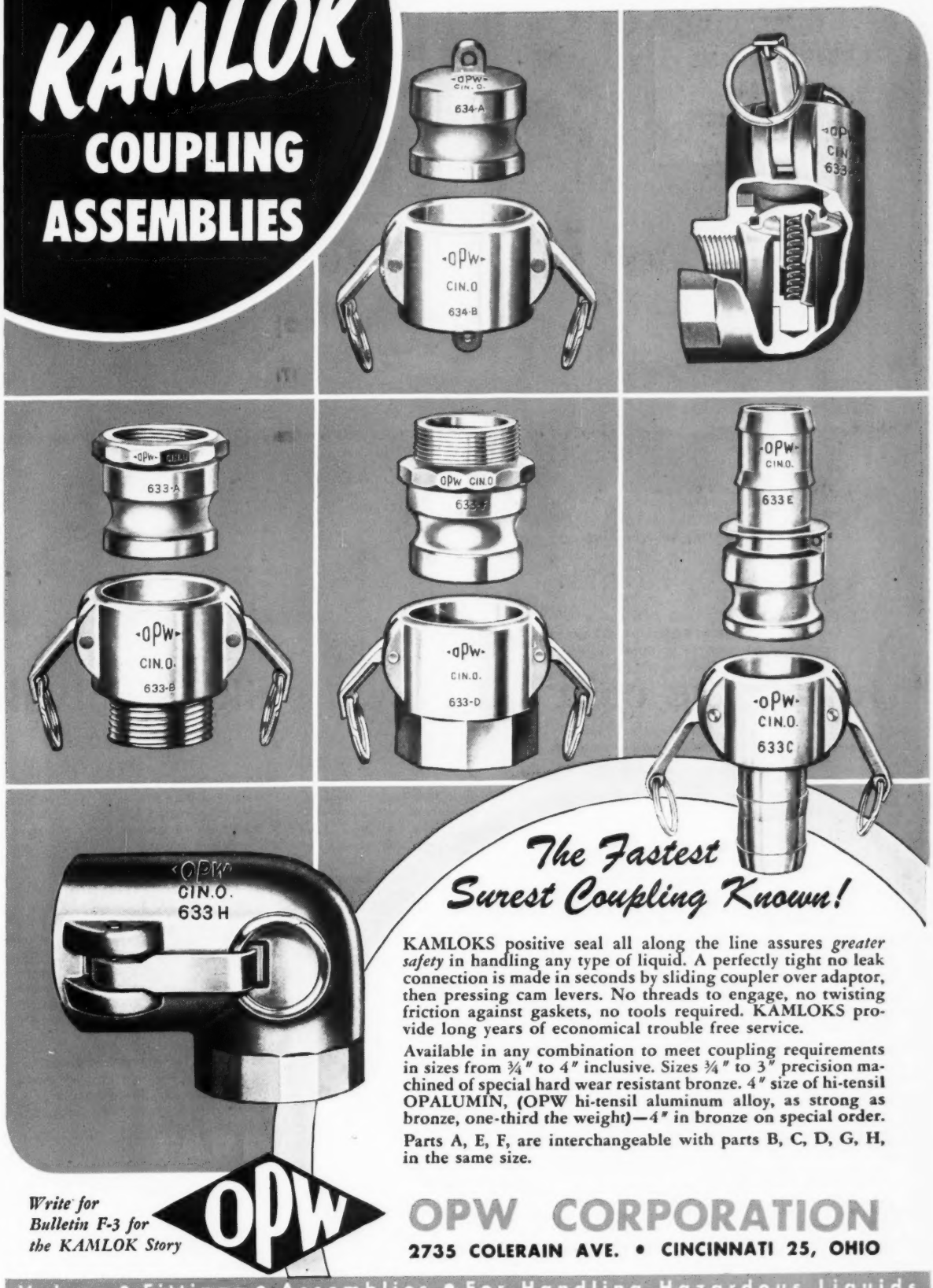
He recommended Purecal T as a reinforcing agent. Now, tearing is reduced to the minimum; production is increased; waste is controlled; and soles flex better without cracking.

This is only one of the many recent developments in rubber based on Wyandotte PURECAL T in GR-S. If you are using GR-S stocks, or want to use them, for tires, tubes, belts, hose, wire insulation—or specification goods requiring high elongation and low compression set—investigate the advantages of PURECAL T now. We'll help you! *Wyandotte Chemicals Corporation, Wyandotte, Mich. Offices in Principal Cities.*

* TRADEMARK

Wyandotte
CHEMICALS

KAMLOK COUPLING ASSEMBLIES



The Fastest Surest Coupling Known!

KAMLOKS positive seal all along the line assures *greater safety* in handling any type of liquid. A perfectly tight no leak connection is made in seconds by sliding coupler over adaptor, then pressing cam levers. No threads to engage, no twisting friction against gaskets, no tools required. KAMLOKS provide long years of economical trouble free service.

Available in any combination to meet coupling requirements in sizes from ¾″ to 4″ inclusive. Sizes ¾″ to 3″ precision machined of special hard wear resistant bronze. 4″ size of hi-tensil OPALUMIN, (OPW hi-tensil aluminum alloy, as strong as bronze, one-third the weight)—4″ in bronze on special order.

Parts A, E, F, are interchangeable with parts B, C, D, G, H, in the same size.

Write for Bulletin F-3 for the KAMLOK Story

OPW

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2735 COLERAIN AVE. • CINCINNATI 25, OHIO

Valves • Fittings • Assemblies • For Handling Hazardous Liquids

CUT MILLING COSTS WITH OUTSTANDING PROCESSING

POLYMEL D

a solid, friable, styrene-indene copolymer resin

HIGHLY EFFECTIVE IN SMALL QUANTITIES

REDUCES DEFECTIVES AND BLISTERING

MAINTAINS HARDNESS

EXCELLENT MOLDABILITY

EXTENDER FOR STYRENE HARDENERS AND STIFFENERS

HIGH DIELECTRIC PROPERTIES

DETACKIFIES HIGHLY LOADED STOCKS

●

HIGHLY ADVANTAGEOUS IN GR-S COMPOUNDING. EXCELLENT PROCESSING FOR ALL HIGHLY LOADED BATCHES

Price: 23½c 1,000 lbs. to a carload, 24c in less quantities, f.o.b. factory.

POLYMEL D IS READILY AVAILABLE

SAMPLES ON REQUEST!

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ALSO ASK ABOUT THESE QUALITY POLYMEL PRODUCTS:

GILSOWAX
(solid)—Extender, Wire Compounds

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(powders)—Hardeners, Stiffeners

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(solid)—Tires, Camelback

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(liquid)—Tires, Camelback, Carcass

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POLYMEL C-130
(solid)—Plasticizer

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(solid)—Non-coloring Detackifier

THE POLYMEL CORP.

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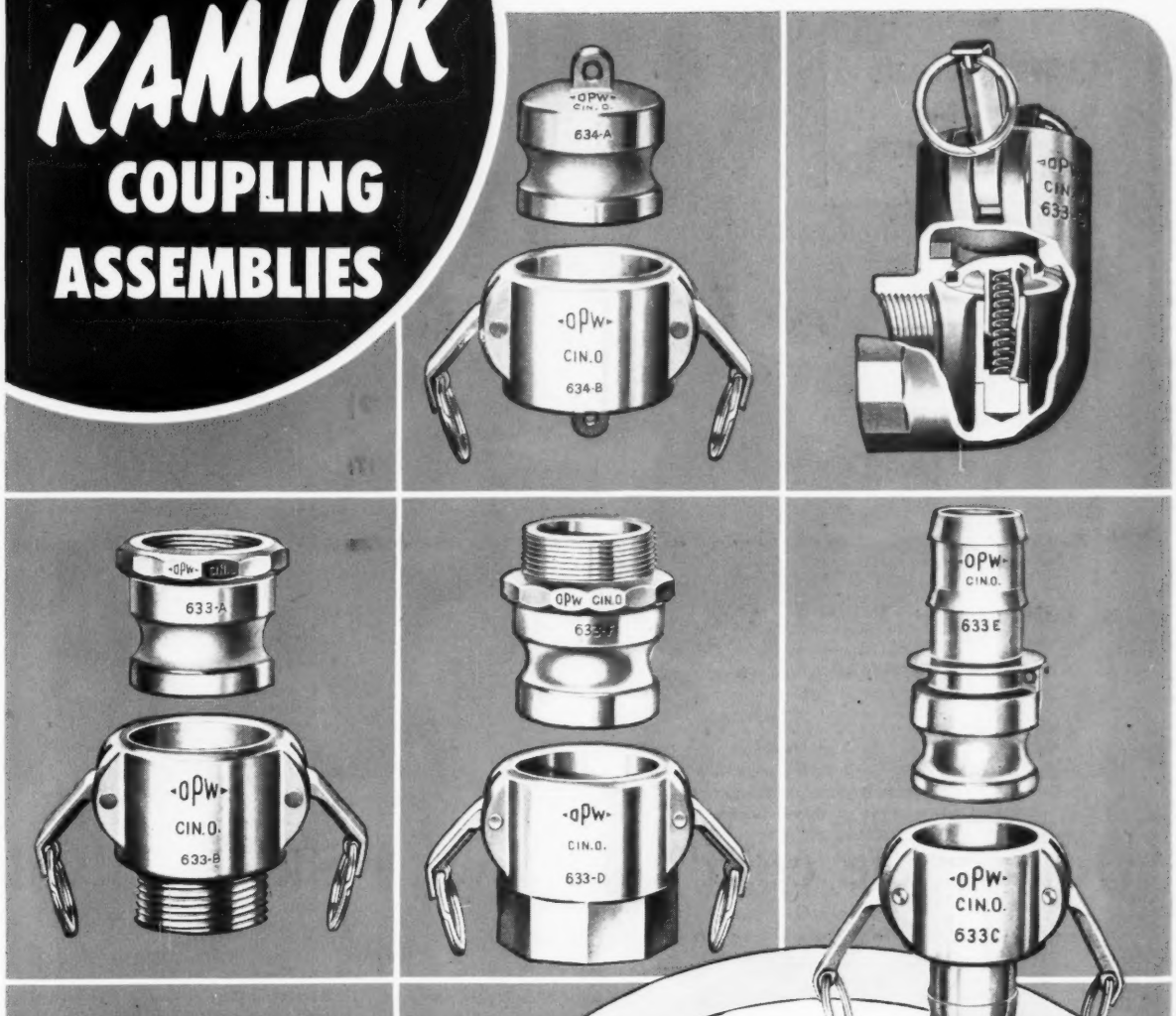
Phone: PLaza 1240

Representatives: Eastern—H. M. Royal, Inc., Trenton, N. J. Western—Merit-Western Co., Los Angeles, Calif.

KAMLOK COUPLING ASSEMBLIES



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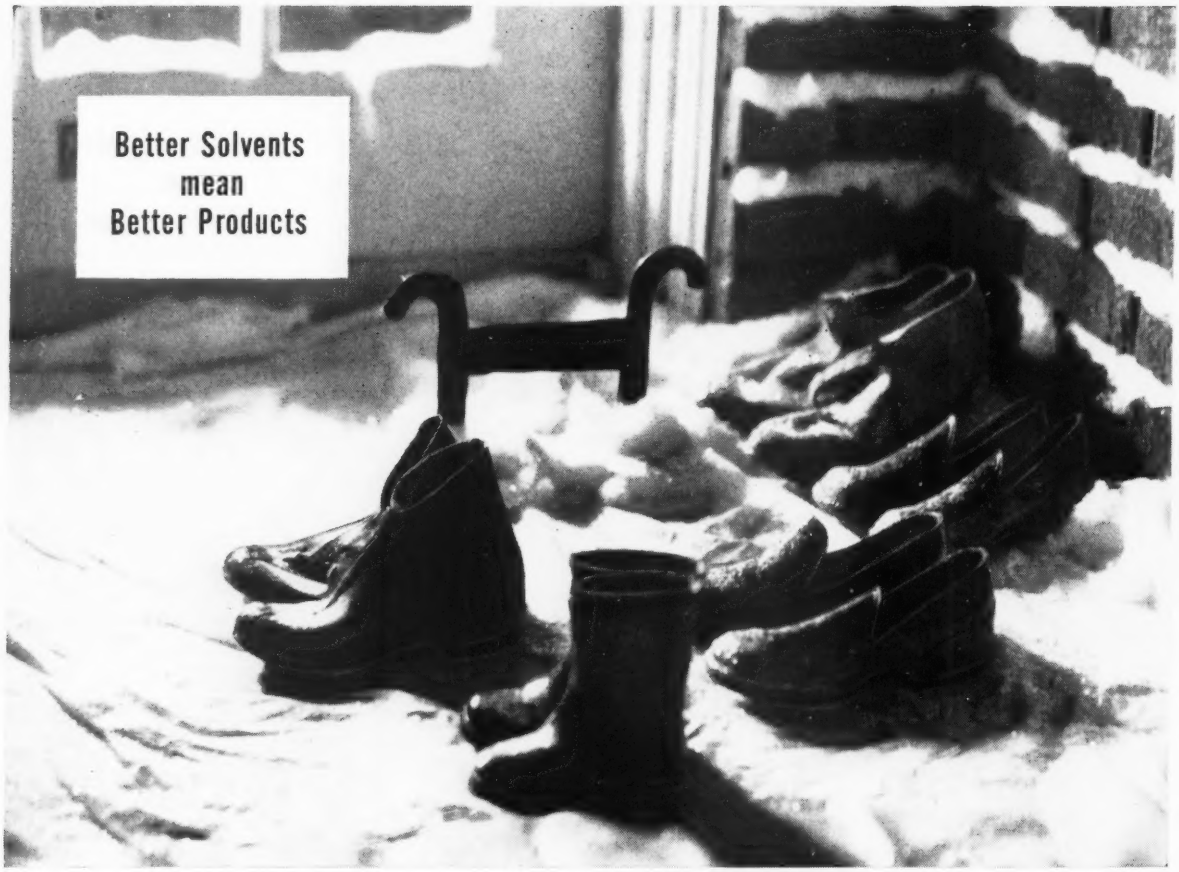
Valves • Fittings • Assemblies • For Handling Hazardous Liquids



"Out in the cold"? Not with Skellysolve!

Skellysolve for Rubber and Related Industries

Applications

SKELLYSOLVE B. For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound. Closed cup flash point about −20°F.

SKELLYSOLVE C. For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve B. Closed cup flash point about 13°F.

SKELLYSOLVE D. For cements and variety of manufacturing operations. Good odor. Quick drying. Minimum of heavy, greasy compounds. Closed cup flash point about 3°F.

SKELLYSOLVE H. For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve D is desired. Closed cup flash point about −20°F.

SKELLYSOLVE V. For use wherever a relatively slow drying solvent is desired. Closed cup flash point about 50°F.

SKELLYSOLVE R. For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens blooming and skinning tendency. Closed cup flash point about −25°F.

"DOC" MacGEE SAYS: Your product will never be "out in the cold" because of solvent uncertainties – not when you standardize on Skellysolve. More than 20 years' experience proves you can depend on Skellysolve to guard the quality of your product – and to help keep your plant operations rolling smoothly . . . with no time out because of solvent let-downs.

You're never in doubt about Skellysolve's uniformity. Every batch has the same over-all properties to protect your product's high quality and to enhance its sales appeal. Here is uniformity guarded by Skellysolve's laboratory tests, unsurpassed manufacturing methods, plus strict quality controls. Remember, too, that Skellysolve is not a "sideline" with us, but a major product operation.

What features do you look for in your solvents? If they're low end points, controlled evaporation, low vapor pressure, a minimum of unsaturates and pyrogenic decomposition products—you get them *all* with Skellysolve!

And Skellysolve's minimum of low and high boiling compounds helps reduce rejects due to blushing and blisters. Controlled vapor pressure reduces danger of bloated containers . . . and minimum of low boiling compounds eliminates "seeds" from rubber cements. Freedom from greasy residues assures rubber cements of high bonding strength.

Write now for more complete technical facts. And if you require special help on solvent applications, you are invited to consult with the Skellysolve Technical Fieldman.

SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY,
KANSAS CITY, MISSOURI

If you're looking for a good general purpose stabilizer

1. EXCELLENT HEAT AND LIGHT STABILITY: Dythal's high available basic lead content assures heat stability in processing. Its excellent ultra-violet light absorption makes for improved light stability in your finished product. It provides low tinting strength, and thus helps make bright colors possible.

...look to "Dutch Boy" DYTHAL

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

2. GOOD ELECTRICAL PROPERTIES: Dythal is particularly effective when used in high temperature insulation compounds.

3. EVEN DISPERSION, LOW VOLUME COST: Dythal disperses uniformly throughout ... gives excellent results in film and sheeting, in extrusions (especially on wire), and in plastisols. If you want to extend the life of your plastic compounds, investigate "Dutch Boy" Dythal, general purpose stabilizer. Consult our technical staff for additional information and data. Write today.

Dutch Boy* CHEMICALS

*Trademarks Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY

111 Broadway, New York 6, N. Y.

3 REASONS WHY

Farrel-Birmingham Should Handle Your Banbury Repairs

A. Welding hard surfacing metal on rotor end plates.

B. Another Banbury rotor is added to the stock rack maintained at the Farrel-Birmingham repair plant.

In spite of the rugged design and construction of the Banbury, hard service and abrasive wear eventually make repairs to the machine a necessity. When this time comes there are three very good reasons why Farrel-Birmingham should handle your Banbury repairs:

1 *Farrel-Birmingham is the* ONLY *company having drawings showing the original dimensions of every part of the Banbury.* When any one of the 775 parts of a Banbury in service needs replacement, a Farrel-Birmingham engineer can look at a drawing and specify the right part in a matter of minutes.

2 *Farrel-Birmingham is the* ONLY *company having complete jigs, fixtures and gauges necessary for satisfactory repairs.* 242 of the pieces of a Banbury have to be machined, calling for a total of 882 operations to finish.

3 *Farrel-Birmingham, as the developer and manufacturer, can best determine what is required to restore a Banbury to its original work capacity.* When a part—such as a rotor, a door top, or the inside of the chamber body, for example—becomes worn, blueprints show the Farrel-Birmingham engineer just how much rebuilding is required to return the part to its original size, contour and work efficiency. There is no guessing—everything is down in blue and white.

It will pay you to turn over your repair work to the ONLY company with complete knowledge of Banbury requirements. For quick service—write, wire or phone.

FARREL-BIRMINGHAM COMPANY, INC.

ANSONIA, CONN. (Telephone Ansonia 4-3331)
AKRON, OHIO, 2710 First National Tower (Tel. Jefferson 3149)
CHICAGO, ILLINOIS, 120 So. LaSalle Street (Tel. ANdover 3-6434)
LOS ANGELES, CALIF., 2032 Sante Fe Avenue (Tel. Lafayette 3017)
HOUSTON, TEXAS, 860-A M&M Building (Tel. Preston 4472)

Farrel-Birmingham®

FB-544A

Route 9 Starts in Southeast Asia

America's highways of the future may be paved with natural rubber from Southeast Asia. Today, test strips of natural rubber asphalt roads have been laid in seventeen states, the District of Columbia and several provinces in Canada. Rubber, added to the road surface, promises to make highways wear longer, hold their shape in winter and summer, and reduce skidding. This is good news for the motorist — as well as the taxpayer trying to save money on road upkeep. On such new uses for natural rubber depend the well-being of millions of people in Southeast Asia, where 95% of the world's natural rubber is grown. The United States is the world's largest rubber user. This tie between East and West means much in the struggle by free nations against Red aggression.

← RESEARCH IN THE EAST
At the Rubber Research Institute of Malaya studies are made of the natural rubber powder used in rubber roads. This powder, mixed with the asphalt, promises to give a tougher, more resilient and longer wearing highway surface.

RESEARCH IN THE WEST →
New rubber road research laboratory, opened by the Natural Rubber Bureau in Rosslyn, Virginia, and working closely with U. S. highway engineers, will do research on how to build better highways at less cost using rubber asphalt top surfacing.

Write for FREE booklet "Stretching Highway Dollars with Rubber Roads"

Natural Rubber Bureau 1631 K Street, N. W., Washington 6, D. C.

Dry stock problem?

...the answer is

KP-555

BUILDERS REPORT EXCELLENT TACK IN N-TYPE RUBBERS WHEN USING KP-555*

*Bis-(dimethyl benzyl) Ether

Check these features!

- ✓ excellent tack
- ✓ good plasticity
- ✓ low cost
- ✓ short mixing time
- ✓ easy extrusion
- ✓ uniform mixes

Manufacturers using acrylonitrile rubbers demand good building tack, easy fast mixing and uniform plasticity even after hot processing.

You may have met these requirements in the past by compounding higher-priced plasticizers—thereby increasing your product costs.

Now—if you're looking for a more efficient, lower-priced plasticizer to place your product in a more competitive position—KP-555 is the answer.

You have available in KP-555 a low-viscosity, relatively high-boiling liquid plasticizer. Its outstanding characteristics with acrylonitrile synthetic rubbers include: excellent building tack, time-saving mixing properties and an impressive low cost.

Write today for technical data, test samples or other information on KP-555. Let our laboratories advise you on the best results obtainable when you use this low-cost product. Inquire Dept. 12-L.

OHIO-APEX, INC.

Division of Food Machinery and Chemical Corporation

Telephone: Nitro 152 **Cable: Ohopex-Nitro**

NITRO, W. VA.

PLASTICIZERS & CHEMICALS — OHIO APEX INC. NITRO, W.VA. MANUFACTURERS

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

...to be glamorized by TITANOX

Raw rubber gives little indication of having a glamorous future when you see it dockside.

Soon these bales will be transformed into gay, colorful swim suits, shower curtains, beach balls, floor tile, toys, and endless other products with the help of Titanox pigments. No other pigment can give such light or bright tints, or whites so white, in natural or synthetic rubber, as TiO_2.

There is a rutile or anatase Titanox pigment for any type of rubber compound. Just bring your problems to our Technical Service Department. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

®**TITANOX**

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

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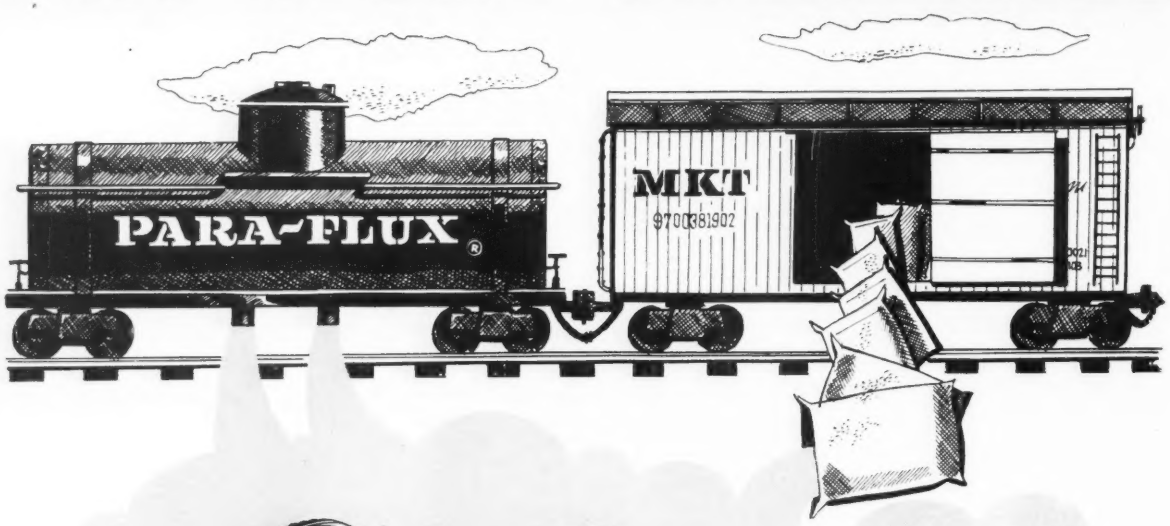
THE RIGHT CHEMICALS



TO MANUFACTURE
THESE RUBBER
PRODUCTS

AKRON, OHIO LOS ANGELES, CALIF.
CHICAGO, ILL. NEWARK, N. J.

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

the plant's enlarged—
the product improved

for users of PLIOVIC

USE PROVED *Products*

EVERY user of vinyl resin can gain from the triple expansion of the plant you see here—source of Goodyear's use-proved vinyl resin, PLIOVIC.

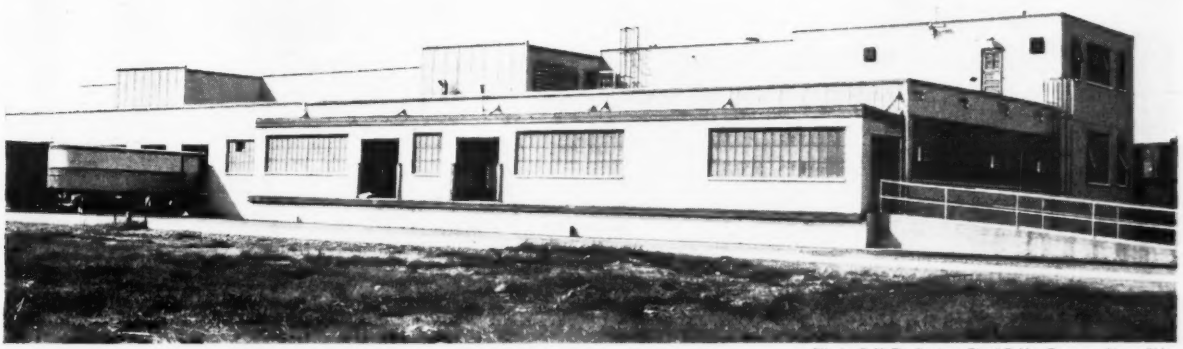
As a result of this expansion in size and improvement in equipment, you can now count on all the PLIOVIC you want—no strings attached. And PLIOVIC now gives users all these advantages: higher resin uniformity; easier processing; lower moisture content; improved thermal stability, bulking and water absorption.

If you produce molded or extruded vinyl items—use organosols, plastisols or latex dispersions—calender, spread or cast—look to PLIOVIC for help to better product quality.

Write today for sample and full information to:

Goodyear, Chemical Division
Akron 16, Ohio

This modern triply-enlarged PLIOVIC *plant assures improved raw material and improved final products to* PLIOVIC *users.*



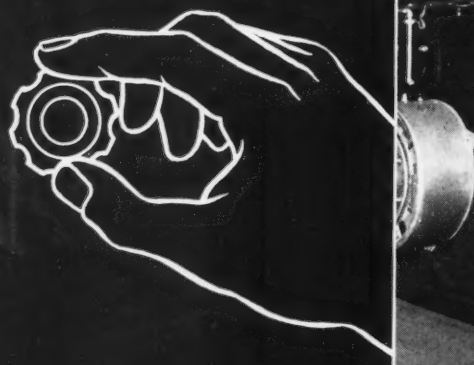
Pliovic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

THE FINEST CHEMICALS FOR INDUSTRY

10,000 Pounds Constant Tension

under fingertip control...



... in this

IOI Nylon Tire Fabric Latexer

Complete one-man process control is but one of the many outstanding advanced-design features of this IOI latexing machine. Here are just a few of the others:

- **Simultaneous impregnation, drying and attenuation of the cords, resulting in pre-stretched tire fabric that requires no further processing prior to calendering.**
- **Direct gas-fired heating, under complete control, provides the correct high temperature required for the most efficient rate of drying either woven or weftless fabric.**
- **Rugged in construction, yet extremely flexible in operation, with constant-tension control at all speeds.**
- **Units available in various capacities, from small production machines up to high speed calender train installations.**
- **These machines require very little cleaning and a minimum of housekeeping maintenance.**

An Industrial Ovens engineer will be glad to call at your convenience to discuss the application of this machine to your particular latexing requirements.

INDUSTRIAL OVENS, INC.

13825 TRISKETT ROAD CLEVELAND 11, OHIO

A useful group of resins for many types of rubber products, including: tubular goods, toys, tires and tubes, waterproofings, cements, floor tile, and many others.

Piccoumaron

Para-Coumarone-Indene RESINS

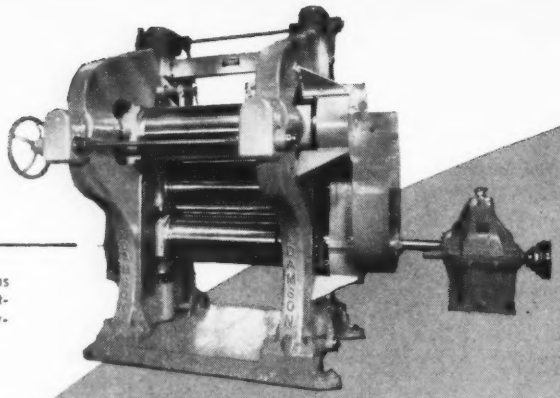
Piccoumaron Resins are soluble in coal tar, turpentine, terpene and most chlorinated solvents. Colors vary from pale yellow to deep reddish brown. Good resistance to acids, alkalies and salt. Available in grades from liquids to brittle solids.

Write for samples and complete data on PICCOUMARON Resins.

PENNSYLVANIA
INDUSTRIAL CHEMICAL CORP.
CLAIRTON, PA.
Plants at: Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

PICCO

Distributed by
Harwick Standard Chemical Co., Akron 5, Ohio



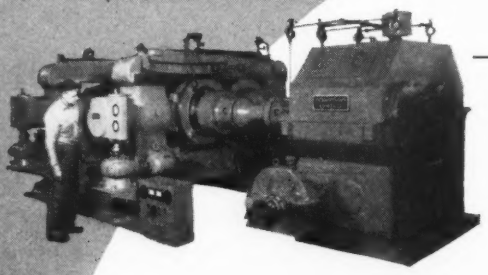
16" x 36" FOUR-ROLL CALENDER

For rubber and sponge products. Has sleeve bearings, herringbone connecting gears, manually operated screw-downs, and grease lubrication.

20" x 54" THREE-ROLL CALENDER

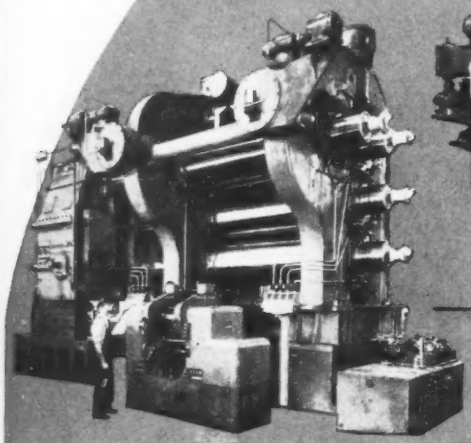
For medium speed production of various types of rubber products. Equipped with herringbone even speed and friction gearing, sleeve bearings, grease lubrication, and motorized roll adjustments. Drive can be adapted to suit available space.

ADAMSON UNITED CALENDERS



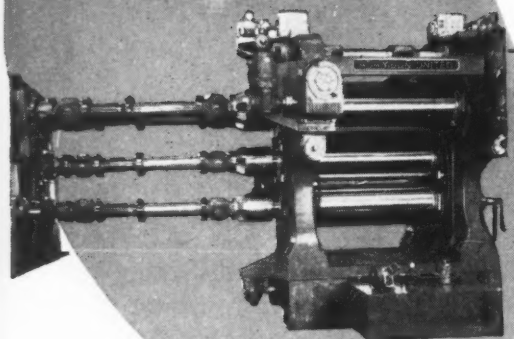
30" x 54" TWO-ROLL HORIZONTAL CALENDER

For finishing asphalt floor tile. This machine is equipped with roller bearings, drilled rolls, pinion stand drive with universal couplings, motorized roll adjustments, and adjustable speed control for tandem operation.



36" x 92" FOUR-ROLL PRECISION CALENDER

Designed especially for the production of thin plastics film up to 72" wide. This unit al is equipped with roller bearings; has roll crossing and zero clearance equipment, moto ized roll adjustments, separate pinion stand with universal couplings and flood lubricatio

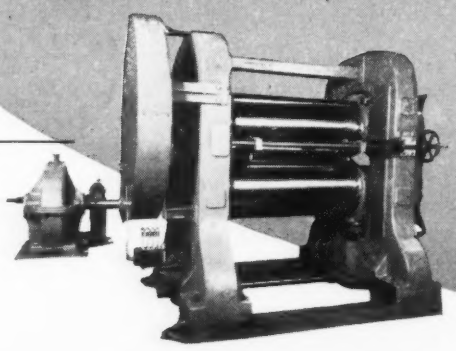


24" x 68" FOUR-ROLL DELUXE PLASTICS CALENDER

Produces 57" wide film at high speeds. Has roller bearings, zero clearance equipment, roll crossing device, roller bearing universal couplings, drilled rolls, motorized stock guides and flood lubrication. Drive is through a separate pinion stand which has its own complete flood lubrication system.

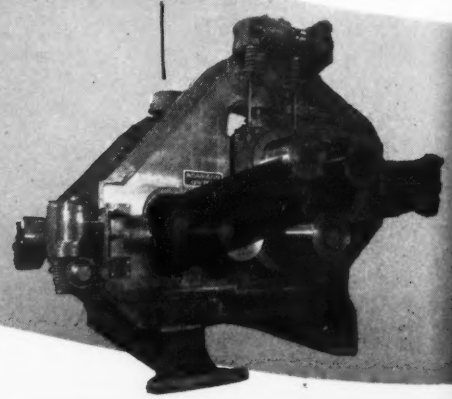
24" x 68" FOUR-ROLL Z-TYPE RUBBER CALENDER

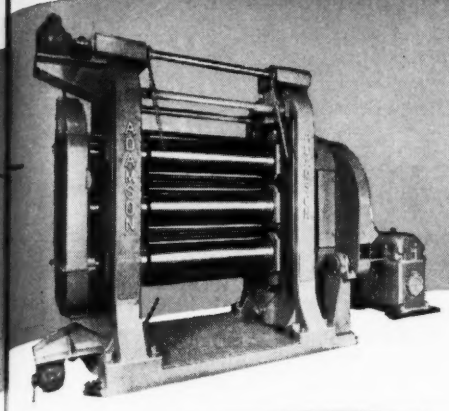
For high speed double-coating of tire fabric. Has sleeve bearings with grease or flood lubrication, motorized roll adjustments, herringbone connecting and drive gears, plus other features required for high speed production.



24" x 52" TWO-ROLL CALENDER

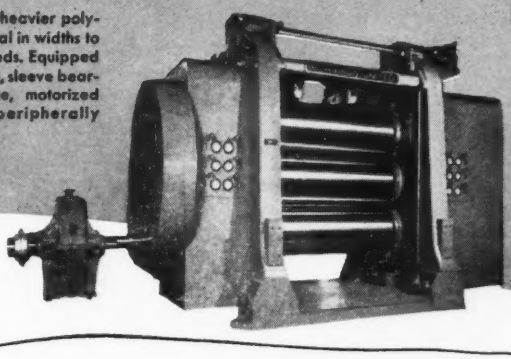
Another Adamson calender, vertical type, used in the production of floor tiling.





24" x 68" FOUR-ROLL STANDARD PLASTICS CALENDER

Produces 2 mil and heavier polyvinyl chloride material in widths to 57" at medium speeds. Equipped with flood lubrication, sleeve bearings, zero clearance, motorized roll adjustments, peripherally drilled rolls.



- for RUBBER and PLASTICS

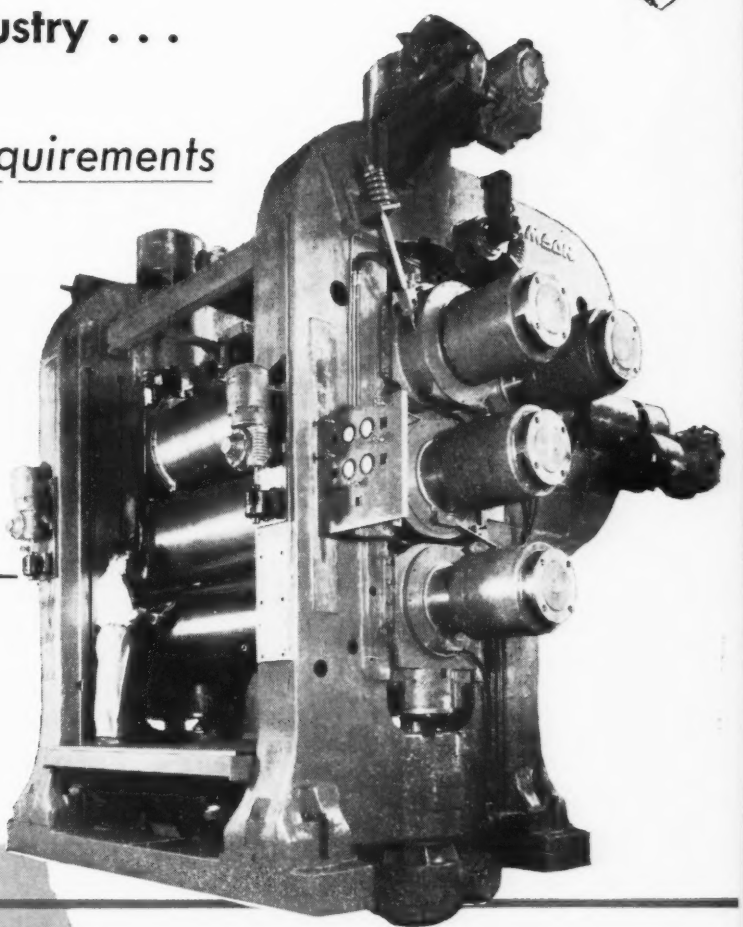
designed for the industry . . .

Engineered to your special requirements

Shown are some of the many types of calenders made to order for our customers.

Given product specifications and required maximum speed, we will design, build and install all basic and auxiliary equipment required for your complete manufacturing process.

We invite your inquiry concerning calendering or any other rubber or plastics processing problem.



32" x 92" FOUR-ROLL PRECISION CALENDER

This unit is geared to produce 72" wide vinyl film, 2 mils and less in thickness, at production speeds up to 150 YPM. It is equipped with anti-friction bearings, zero clearance, motor operated stock guides, motor operated roll crossing device, flood lubrication, universal couplings, pinion gear stand, drilled rolls and automatic temperature control. The electrical drive includes separate DC motors for each component, with speed trimming devices. Auxiliaries consist of embossing equipment, cooling unit and automatic turret-type windup.

ADAMSON UNITED COMPANY

730 CARROLL ST., AKRON 4, OHIO

A Name as old as the Rubber Industry

Branch Offices in Principal Cities

Subsidiary of United Engineering and Foundry Company

***Plants at:* Pittsburgh • Vandergrift • New Castle • Youngstown • Canton**

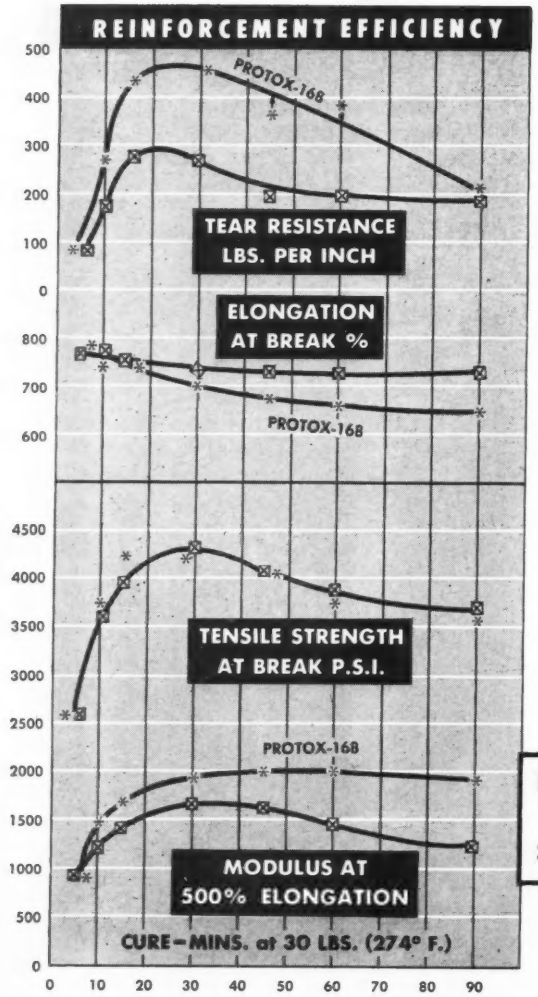
BETTER MACHINES AND PROCESSES FOR BETTER RUBBER AND PLASTICS PRODUCTS

ACTIVATOR NEWS

HORSE HEAD PRODUCTS

A supplement to THE ACTIVATOR—the house organ issued by The New Jersey Zinc Company for over 15 years to aid the Rubber Industry in its use of Zinc Oxide.

PROTOX-168 SETS 3 NEW HIGHS IN ZINC OXIDE EFFICIENCY



Protox-168*, the first propionic acid-treated fast-curing zinc oxide, makes better quality rubber compounds at lower cost:

1 Reinforcement Efficiency

Protox-168, as indicated in these charts, imparts higher modulus and tear resistance than an untreated, fast-curing oxide of equal surface area (about 8 sq. meters per gram).

The results reflect these characteristics of Protox-168:

a. Better wetting by rubber
b. More complete dispersion
c. Fewer aggregates to serve as tear centers
d. Long modulus-cure plateau—available for the first time in a fast-curing oxide

2 Activation Efficiency

The more complete dispersion of Protox-168 gives greater surface area for activation.

3 Processing Efficiency

The zinc propionate coating on Protox-168 provides processing economies through faster incorporation, easier calendering and tubing.

To check these advantages of Protox-168 in your compounds, we shall be glad to send you samples.

☒ Untreated, fast-curing Zinc Oxide (Approx. 8 sq. meters per gram).

✻ PROTOX—168

COMPOUND	
SMOKED SHEET	100
SULFUR	3
M B T	1
STEARIC ACID	3
AGERITE POWDER	1
ZINC OXIDE	100

*U. S. Patents 2,303,329 and 2,303,330

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

... most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

HORSE HEAD PRODUCTS

A Case for PX Plasticizers

HAVE you seen the newest pieces of vinyl plastic luggage for women? They won't stain, chip or crack and they'll outwear and outlast natural materials. Some cases, like the smart looking ladies' gladstone at left, are made of heavy, unsupported vinyl sheeting. They have a flexibility that allows them to take years of punishment without showing it.

You can thank the *plasticizer* for that important property. And you can be doubly sure of good flexibility and permanence if the plasticizer is one of the broad family of quality-controlled Pittsburgh PX Plasticizers.

As a basic and integrated producer of coal chemicals we have the important advantage of being able to control the quality and uniformity of Pittsburgh Plasticizers from coal to finished product. And *you* benefit by consistent plasticizer performance . . . improved characteristics in your finished plastic products . . . and by dependable, continuing supplies. ● We'll be glad to send you samples and specification sheets or provide you with any technical assistance you may need. *Write today!*

PX-104	DiButyl Phthalate
PX-108	DilsoOctyl Phthalate
PX-138	DiOctyl Phthalate
PX-208	DilsoOctyl Adipate
PX-238	DiOctyl Adipate
PX-404	DiButyl Sebacate
PX-408	DilsoOctyl Sebacate
PX-438	DiOctyl Sebacate
PX-658	TetraHydroFurfuryl Oleate
PX-917	TriCresyl Phosphate

W&D 4161

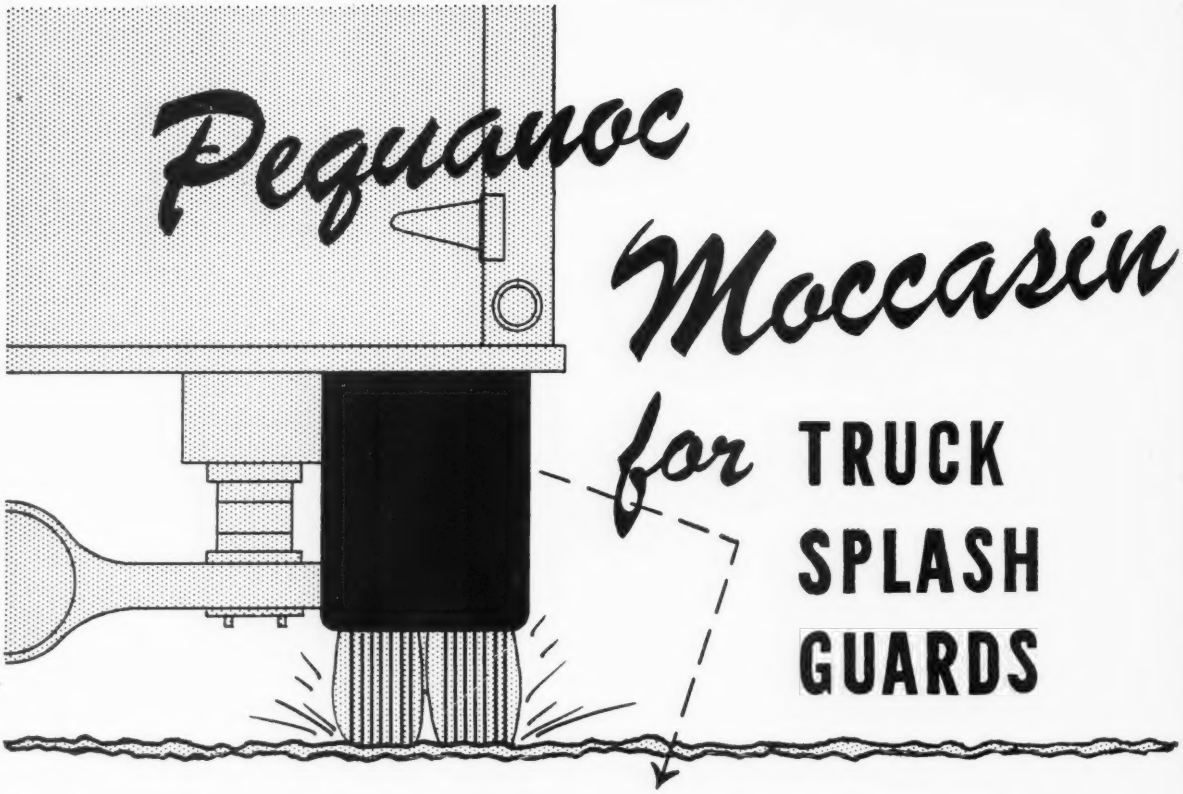
PLASTICIZER DIVISION

P C&C C ®

PITTSBURGH COKE & CHEMICAL CO.

Grant Building · Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON



Pequanoc Moccasin for TRUCK SPLASH GUARDS

Truck splash guards take a real "beating." That's why many rubber manufacturers use Pequanoc Moccasin Reclaim in their splash guard compounds. Here's a typical formula with costs and physical characteristics:

Pequanoc Moccasin Reclaim	43.40
Mineral Rubber	8.70
Zinc Oxide	.55
Soft Clay	6.50
Whiting	17.40
Laminar	17.40
HC Magnesia	.40
Anti-Flex Cracking Antioxidant	.25
MBTS	.33
DOTG	.17
Plasticizing Oil	4.30
Sulfur	.60
	100.00
Lb. Cost	$.060
Specific Gravity	1.52
Volume Cost	$.0912
Tensile	450-500
Elongation	300%
"A" Durometer	78

We'll gladly send you a test sample of Moccasin. Write for it today.

Pequanoc Rubber Co.

MANUFACTURERS OF RECLAIMED RUBBER

MAIN SALES OFFICE and FACTORY: BUTLER, N. J.

COLOR

for All Rubber and Plastic Needs!

* **STANTONE PC**
  Paste...Dispersed in plasticizer for Organosol and Plastisol Vinyl Resins.
* **STANTONE POWDER**
  For general coloring use in all types of compounds.
* **STANTONE LPC**
  Pulp...For Latex.
* **STANTONE GPE**
  Ground dispersion in Polyethylene and other resins.
* **STANTONE MBS–MASTERBATCH**
  Emulsion dispersed in plastic, precipitated and standardized in color intensity for precision color matching, cleaner compounding.
* **STANTONE RUBBER INKS**
  For Rubber and Plastic Printing.

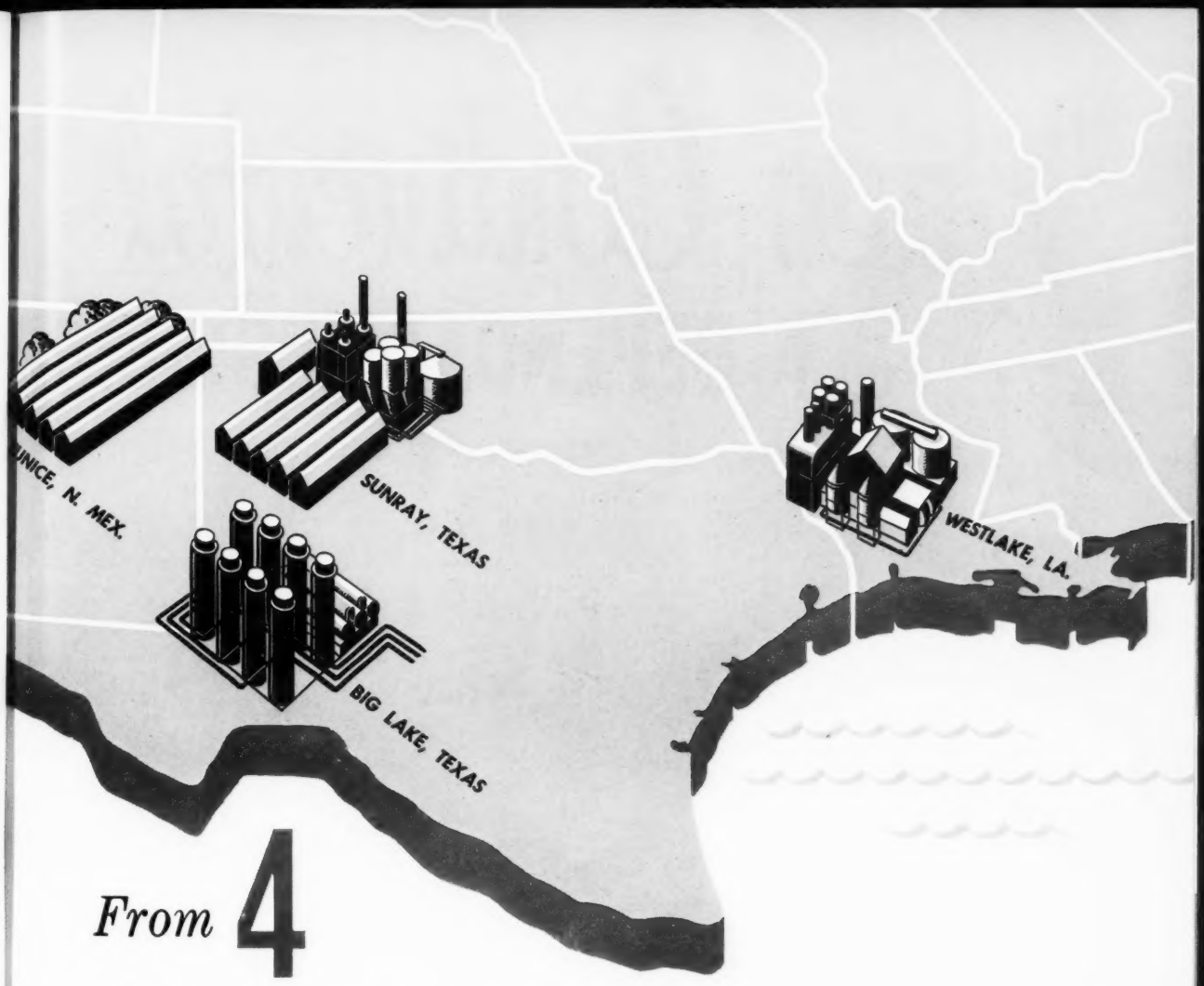
STANTONE is a name registered by Harwick Standard Chemical Company.

WRITE for complete technical data on COLOR for any need.

HARWICK STANDARD CHEMICAL CO.

AKRON, OHIO

BRANCHES: BOSTON, TRENTON, CHICAGO, LOS ANGELES



From **4**

Witco-Continental Plants . . .

A COMPLETE LINE OF CARBON BLACKS

FURNACE BLACKS

Continex SRF, SRF-NS

Continex HMF

Continex HAF

Continex FEF

CHANNEL BLACKS

Continental AA (EPC)
Witco No. 12

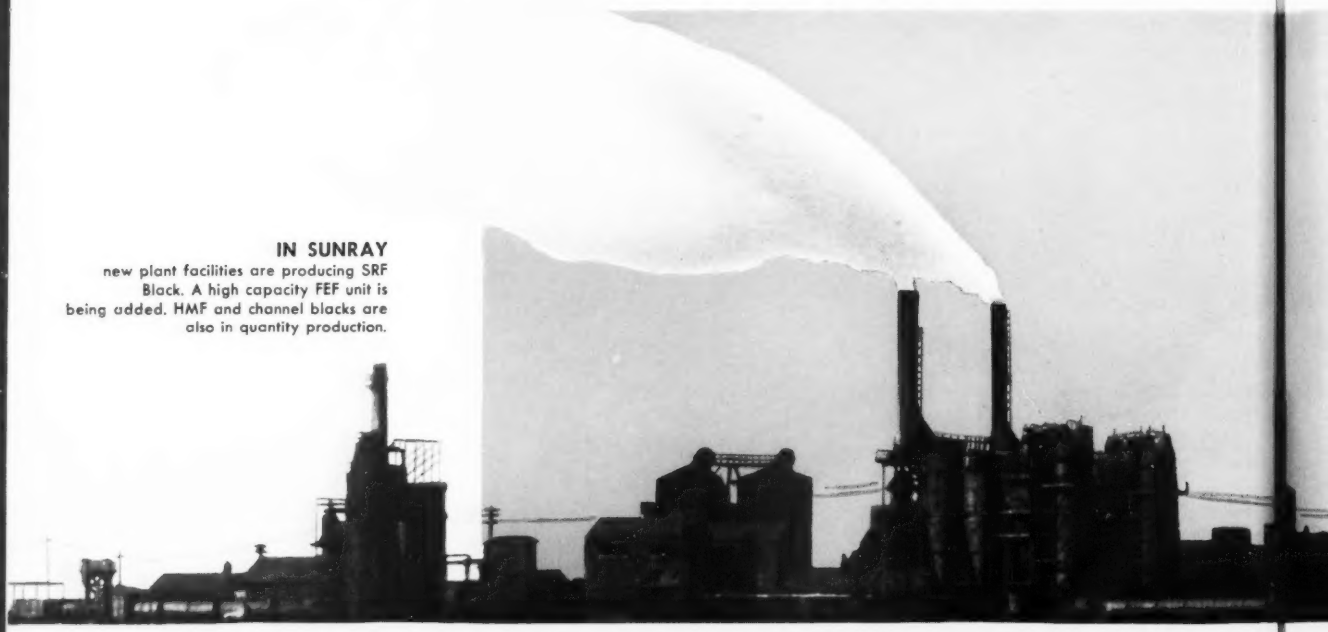
Continental A (MPC)
Witco No. 1

Continental F (HPC)
Witco No. 6

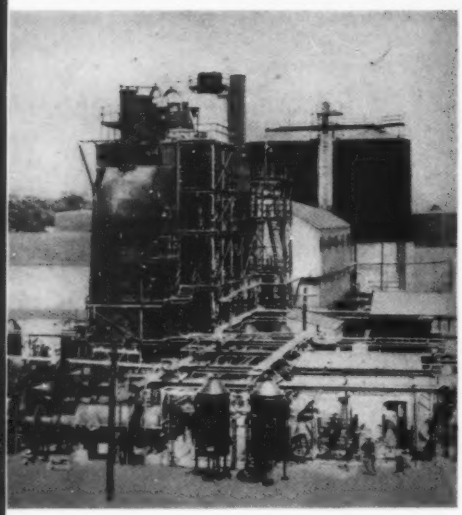
Continental R-40 (CC)

Witco-Continental

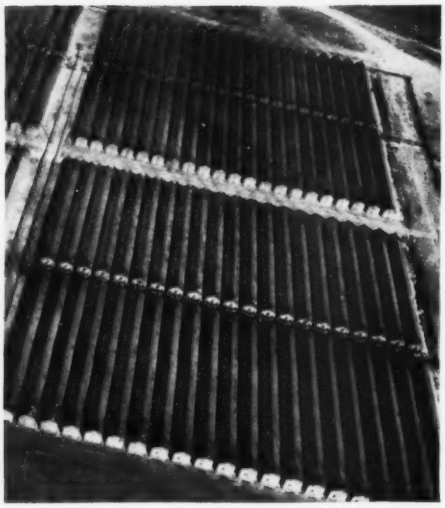
A DEPENDABLE SOURCE O



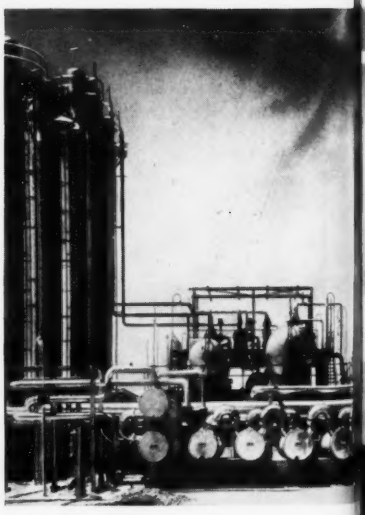
IN SUNRAY
new plant facilities are producing SRF Black. A high capacity FEF unit is being added. HMF and channel blacks are also in quantity production.



IN WESTLAKE
Witco-Continental's new plant is in full-scale production of HAF Black. These facilities are being expanded, and production will be almost doubled this year.



IN EUNICE, N. M.,
hundreds of acres of channel black burner houses produce a complete range of channel blacks.



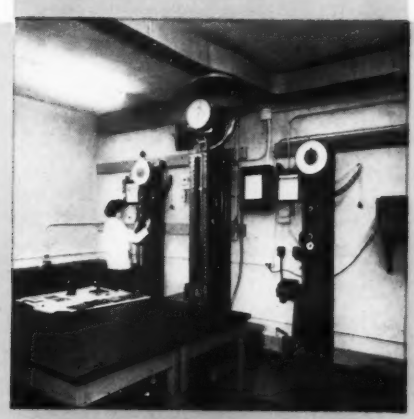
AT BIG LAKE, TEXAS,
Witco's natural gas plant produces channel
from residual gas.

Both plants are located at points where natural gas is still available at moderate cost, assuring customers of a continuous supply at reasonable prices.

CE OF SUPPLY

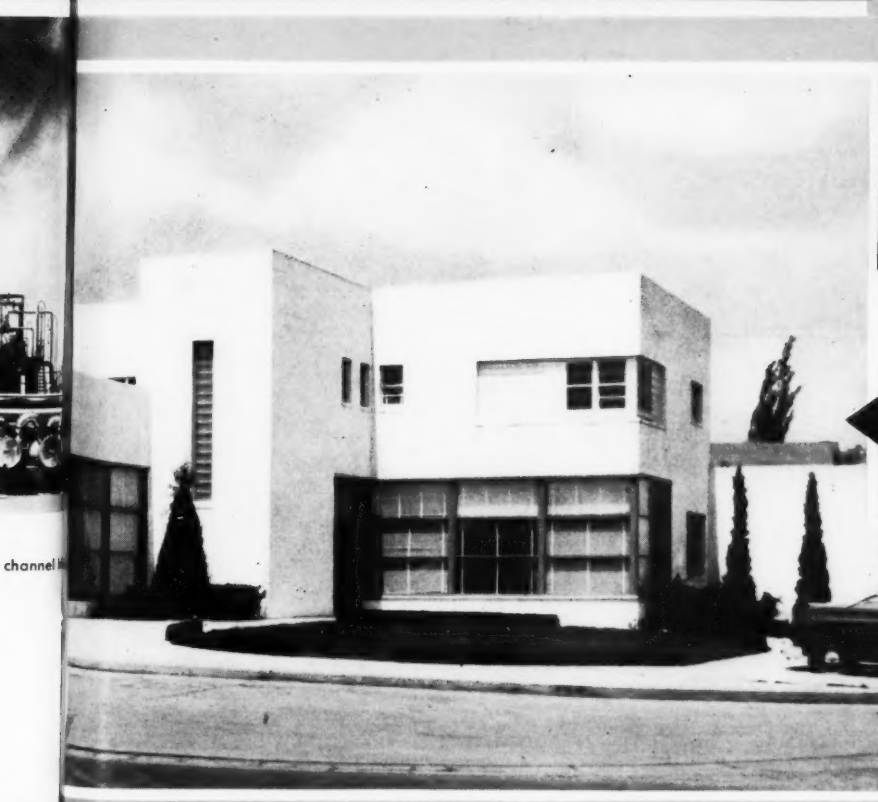
backed by the most modern research and technical service facilities . . .

Sectional view of mill room showing compounding of rubber test batches.



Scott Testers for evaluation of rubber compounds; center machine for elevated temperature tests.

Sectional view of laboratory mill room showing rubber mills, open steam vulcanizer, curing presses.



WITCO-CONTINENTAL CARBON BLACK LABORATORY, AMARILLO, TEXAS.

Staffed by experts, whose long experience in carbon blacks is at your service.

WITCO-CONTINENTAL'S

STEADY EXPANSION

is the direct result of your ever-increasing demands for Witco quality products . . . quality assured by:

Modern manufacturing and research facilities
Strict production control
Long experience
Maximum technical service

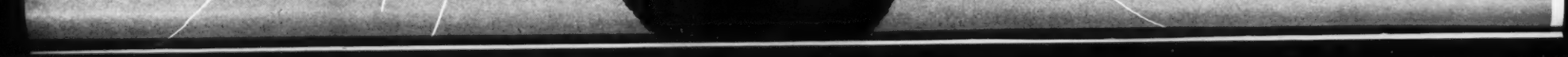
In addition to its complete line of carbon blacks, Witco also makes rubber additives and compounding ingredients. Descriptive literature will be sent on request . . . company stationery, please.

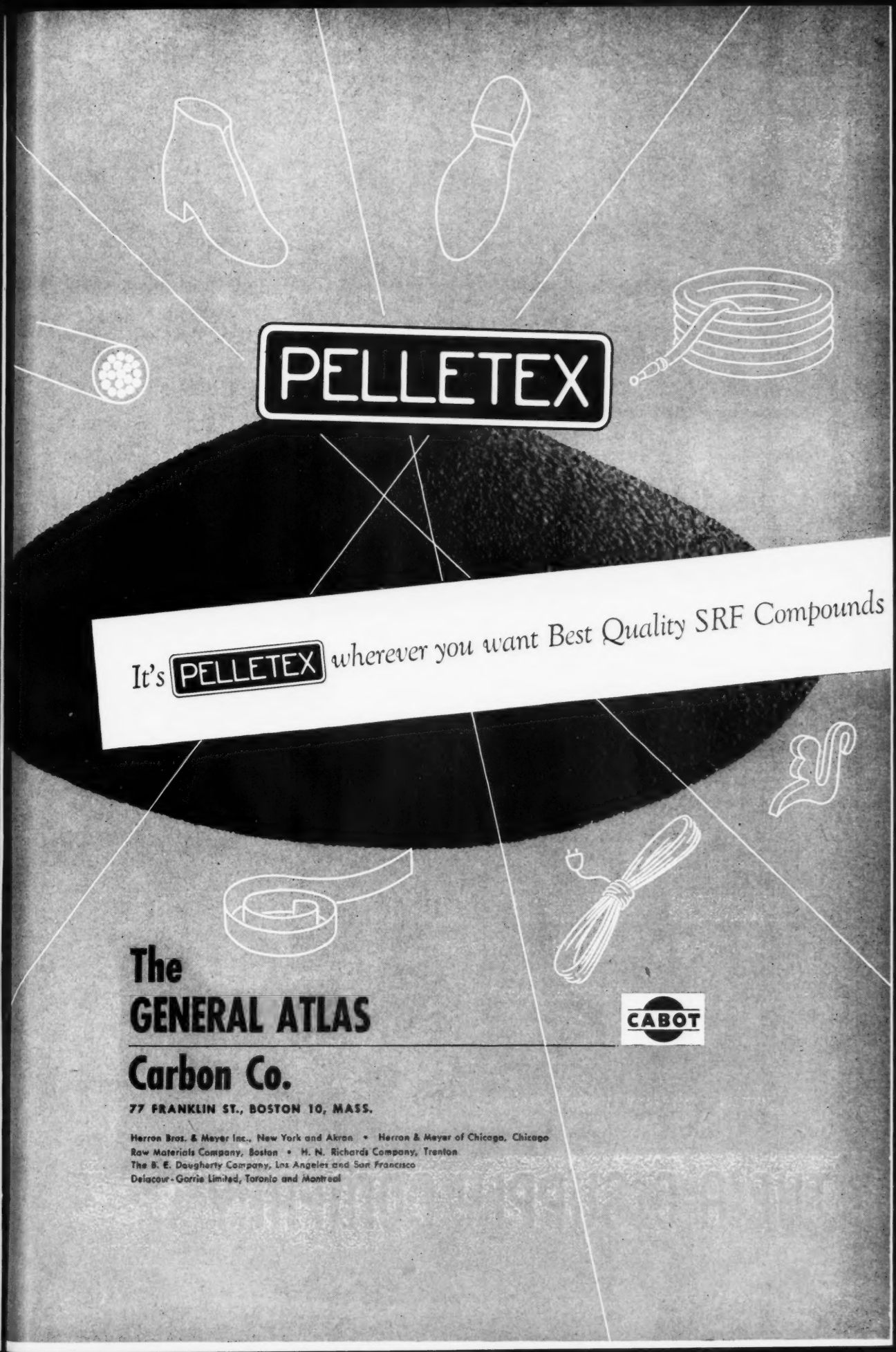
Write today for complete information on any of these Witco products.

WITCO CHEMICAL COMPANY
CONTINENTAL CARBON COMPANY

295 MADISON AVENUE, NEW YORK 17, N. Y.

AKRON • AMARILLO • LOS ANGELES • BOSTON
CHICAGO • HOUSTON • CLEVELAND
SAN FRANCISCO • LONDON AND
MANCHESTER, ENGLAND





The GENERAL ATLAS Carbon Co.

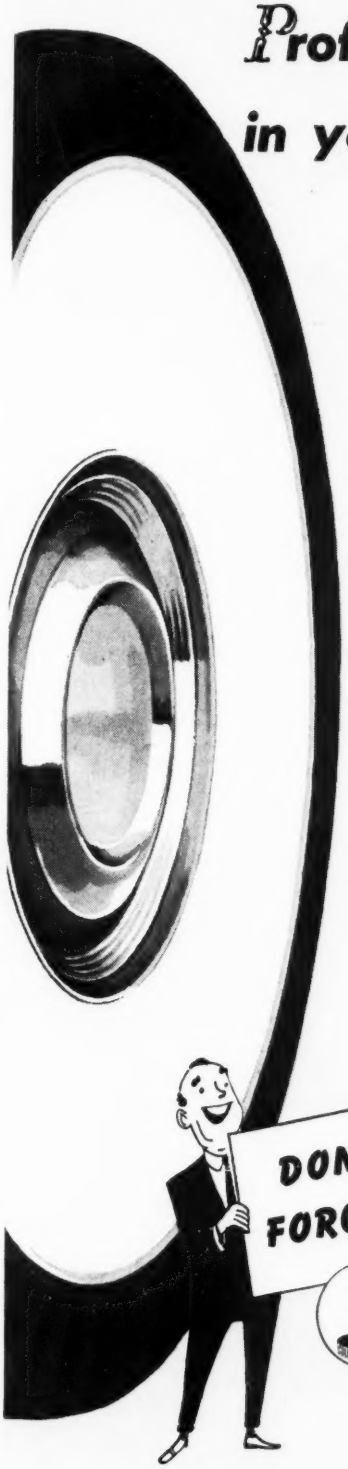
CABOT

77 FRANKLIN ST., BOSTON 10, MASS.

Herron Bros. & Meyer Inc., New York and Akron • Herron & Meyer of Chicago, Chicago
Raw Materials Company, Boston • H. N. Richards Company, Trenton
The B. E. Dougherty Company, Los Angeles and San Francisco
Delacour-Garrie Limited, Toronto and Montreal

Profit with HI-SIL

in your White Sidewall Compounds



Prior to the recently amended M-2 Rubber Control Order, many compounders ran compounds loaded with titanium and zinc oxide. Compounders should now consider using Hi-Sil to replace the zinc oxide, retaining only enough for activation.

This changeover to Hi-Sil offers many advantages in white sidewall manufacture.

LOWER COST

Hi-Sil has a lower volume cost than zinc oxide. The specific gravity of Hi-Sil is only 1.95 compared with 5.57 for zinc oxide. Therefore the volume cost of Hi-Sil is less than one-quarter that of zinc oxide.

BETTER QUALITY

Hi-Sil loaded white sidewall stocks have better snag and tear resistance and are more resistant to curb scuffing.

EASIER PROCESSING

Hi-Sil compounds are easier to build because they are firm. Zinc oxide stocks are soft and easily deformed. *Hi-Sil prevents light spots in molding.* Zinc oxide stocks flow too readily and trap air between the mold and uncured tire. *Hi-Sil stocks are stiffer, with good hot tear.* They prevent blemishes and torn spots at the vents. *Hi-Sil stocks have high modulus and take buffing well; brands and size marks stay sharp and distinct.* Low modulus stocks of zinc oxide stretch with the buffer instead of resisting it.

HI-SIL IS ALSO EXCELLENT FOR REINFORCING WHITE OR COLORED MOLDED GOODS

Hi-Sil is a top quality reinforcing pigment that imparts an extremely high level of physical properties.

You are invited to write, wire or telephone today for further information. Also, please feel free to call upon Columbia-Southern's Technical Staff. They are always glad to assist you in any way possible.

COLUMBIA-SOUTHERN
CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
FIFTH AVE. AT BELLEFIELD · PITTSBURGH 13, PA.

EXECUTIVE OFFICES: FIFTH AVENUE AT BELLEFIELD, PITTSBURGH 13, PA. TELEPHONE MAYFLOWER 1-2960.
DISTRICT OFFICES: BOSTON • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • HOUSTON • DALLAS
MINNEAPOLIS • NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS

"TAG" Automatic Controllers Record Temperature, Pressure

Pressure, vacuum or temperature can be automatically regulated and recorded with the Pneumatic Recorder-Controllers produced by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. These devices maintain conditions for which they are set by varying control line air pressure, which operates a diaphragm valve to regulate flow of fluid (gas, steam, liquid) to the equipment being controlled. At the same time, the instrument continuously records actual temperature or pressure on a circular chart.

Operating on an air supply of 18 p.s.i., TAG Recorder-Controllers handle temperatures between −100°F. and 1000°F., vacuum as great as 30" mercury, or pressures up to 7500 p.s.i.

"TAG" Temperature Recorders Chart from −300° to +1000°F.

Accurate written records of varying temperatures are charted by the Temperature Recorders produced by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. Temperatures as low as −300°F. or as high as +1000°F. can be recorded with these versatile instruments.

Various types of actuations in TAG Temperature Recorders achieve scale expansion for utmost precision over the working ranges. Interchangeable tube systems are laboratory calibrated at the factory. A safety link provides over-range protection. Details are given in Catalog 1210.

"TAG" Pneumatic Controllers Govern Temperature, Pressure

Pressure, vacuum or temperature can be accurately regulated by the Pneumatic Controllers engineered by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. These trustworthy devices maintain the conditions for which they are set by varying air pressure in a control line, which in turn operates a diaphragm valve to increase or decrease the flow of fluid (air, gas, steam, liquid) to the equipment being controlled.

Operating on an air supply of 18 p.s.i. pressure, TAG controllers handle temperatures between −100°F. and 1000°F., or pressures between 30" vacuum and 7500 p.s.i.

SHARPLES XTRUDED ULTRA ACCELERATORS

THE 9 SERIES

NON-DUSTING,
FREE-FLOWING
PELLETS

SA 52-9 TETRA**METHYL**THIURAM **DI**SULFIDE

SA 62-9 TETRA**ETHYL**THIURAM **DI**SULFIDE

SA 57-9 **ZINC** DI**METHYL**DITHIOCARBAMATE

SA 67-9 **ZINC** DI**ETHYL**DITHIOCARBAMATE

SA 77-9 **ZINC** DI**BUTYL**DITHIOCARBAMATE

Use in mill and banbury mixed compounds for minimum dusting, easier handling and improved dispersions.

Use in latex for both ball mill and colloid mill dispersions.

SHARPLES CHEMICALS INC.

350 Fifth Ave., New York
80 E. Jackson Blvd., Chicago
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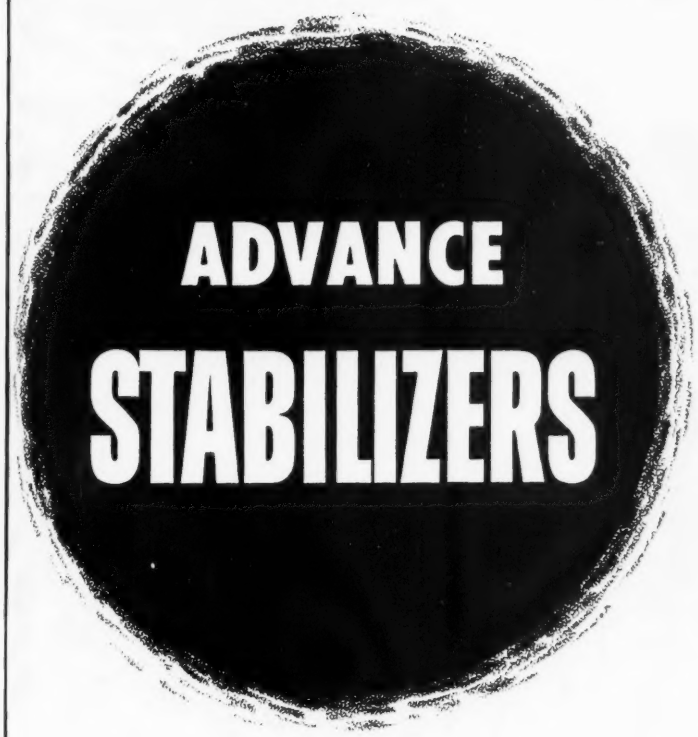

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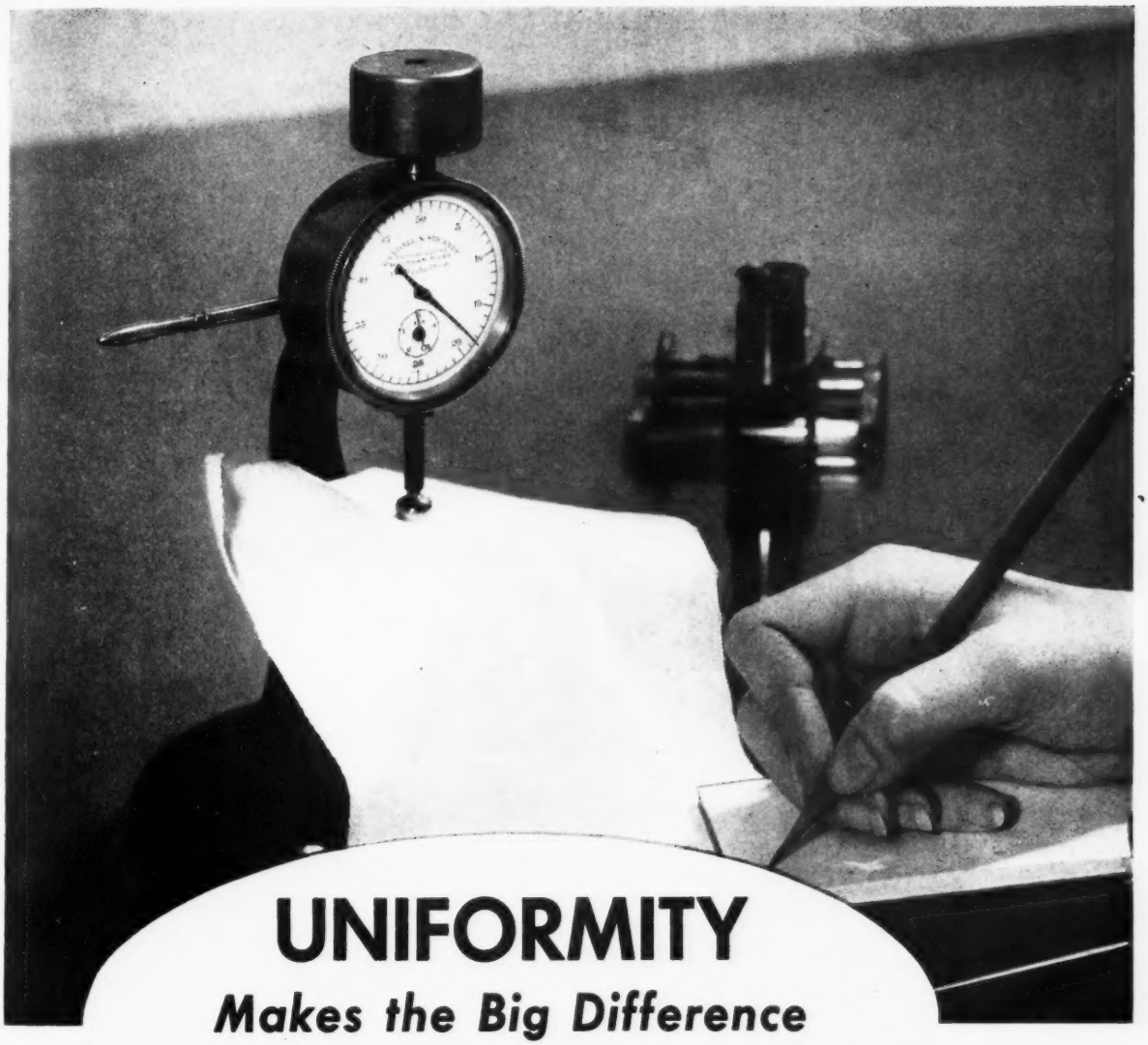

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Army Ordnance Mechanical Rubber Goods[1]

Gerald Reinsmith[2] and Irving Kahn[2]

AS A preliminary to this article, when presented before the Chicago Rubber Group by Mr. Reinsmith, some time was spent outlining the organization of the Department of Defense, with special reference to the Ordnance Corps, and how the latter organization was set up to develop and procure military rubber products. This portion of the talk is not included in this published version, but certain government publications of particular interest to those considering selling to any Defense Agency were mentioned and are listed below:

(1) "Index of Military Purchasing Offices." This booklet may be obtained free from Central Military Procurement, Information Office, Munitions Board, The Pentagon, Washington 25, D. C. The booklet does not contain information on all products purchased for military use, but does list those which have been assigned to specific departments for centralized procurement.

(2) "How to Sell to the United States Army." This booklet contains a wealth of information on such things as who does the purchasing, where it is done, various types of contracts, mistakes in bids, subcontracting, specifications, inspection, delivery schedules, payment, and information on local purchases. It may be obtained from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. Price 30¢.

India RUBBER WORLD is glad to be able to cooperate with the authors of this article and the Defense Department in providing the rubber industry with this review of Ordnance present and future needs for rubber products.
Editor

ALTHOUGH this paper is devoted primarily to mechanical rubber goods used by Army Ordnance, we feel that a list of all the various classifications of rubber goods of interest to the Ordnance Corps, ranked in the order of their relative significance in procurement, should be included. The list follows: (1) tires, tubes, tank track blocks and bushings, tank bogie wheels and bands and idler wheels; (2) mechanical rubber goods; (3) insulated wire and cable; (4) coated fabrics; (5) hard rubber products; (6) rubber cements and sealants.

As you can see, mechanical rubber goods are second in importance in the list. Generally, these items must be suitable for different types of Ordnance vehicles such as tanks, trucks, and passenger cars, and for the most part must perform satisfactorily in all climates whith temperatures ranging from at least —65 to +160° F. The events of the last few years have shown that our problems with rubber products for military use occur mostly when these products are used in the lower part of the above temperature range. In addition, other characteristics must be provided to meet the most severe conditions of military service; among them are resistance to fuels and lubricants, resistance to ozone, and maintenance of original properties after lengthy periods of outdoor exposure.

Rubber Products for Ordnance Use

The following illustrations will give some idea of the main types of Ordnance mechanical rubber goods together with their uses and service requirements.

Belts

In Figure 1 are shown two of the main types of belting used—flat belts and V-belts. The former are used at arsenals and depots for the transmission of power. The V-belts are used in vehicles, in gun mechanisms, and for power transmission on small tools such as lathes and drill presses. Ordnance must at present stock two types of V-belts for combat vehicles: one for use in warm climates and one for arctic use. These belts are currently being manufactured of low styrene GR-S. Experimental belts made of a butadiene/styrene/isoprene synthetic rubber are being evaluated also for use through the entire temperature range. Arrangements, moreover, have recently been made with Connecticut Hard Rubber Co. for the fabrication of V-belts made of silicone rubber. If these silicone rubber V-belts prove successful, one-type belt will replace the two types now required. The flat belting similar to item 4 in Figure 1 is being used as skirting over tank tracks. Used in this manner, the belting acts as a fender over the tank tracks and protects

[1] Based on a paper presented before the Chicago Rubber Group, Chicago, Ill., Mar. 21, 1952. The opinions or assertions contained herein are the authors' and are not to be construed as official or restricting the views of the Department of the Army.

[2] Materials engineers, Office, Chief of Ordnance, Department of the Army, Washington 25, D. C.

soldiers riding on tanks from getting caught in the tracks. The belting is re-inforced with three-ply duck and is approximately ¼-inch thick.

Engine Mounts and Insulators

Ordnance uses engine mounts and vibration insulators in many shapes and forms. The primary function of these products is, of course, to reduce vibration, shock, and noise. These products also provide a flexible connection between various machine or other parts which, if rigidly connected with metal, might result in the failure of the metal connecting part due to the concentration of strains at that point.

Tank Shoe Bushing, Couplings, Etc.

The basic design of the tracks used on modern military tracklaying vehicles of the United States was developed about 1934. The "heart" of this type of track, as shown by item 1 of Figure 2, is the precompressed rubber bushing which serves as the articulating joint between adjacent shoes. The present type of bushing involves the vulcanization of a series of rubber "donuts" on a central metal member, which usually takes the form of a pin or sleeve. The O. D. of these "donuts," as molded, is greater than the bore into which the rubber bushing is finally inserted. In the assembly operation, the rubber "donuts" are compressed radially while being elongated axially. The amount of radial precompression can be varied according to the anticipated loading.

The service life of the rubber bushings in Ordnance tracks has been quite satisfactory under conditions where service conditions remain substantially the same as those predicted at the time the bushings were designed. Wherever premature failures have been prevalent, investigation usually showed that the operating characteristics of the vehicles had been drastically changed. The wires extending from the bushing are used for the dissipation of any static electricity that may accumulate on the bushing.

Besides the rubber articulated joints in the tracks of our military vehicles, it has been found desirable, in many cases, to rubberize the track shoe or tread. Originally these track shoes were of a single rectangular cross-section which provided adequate traction on dry pavements or for normal cross-country operation. Whenever mud conditions were encountered, the traction was increased by the employment of detachable metal grouser bars. Subsequently various tread profiles were designed and tested, with the result that a chevron design was adopted as being the most satisfactory from the stand-

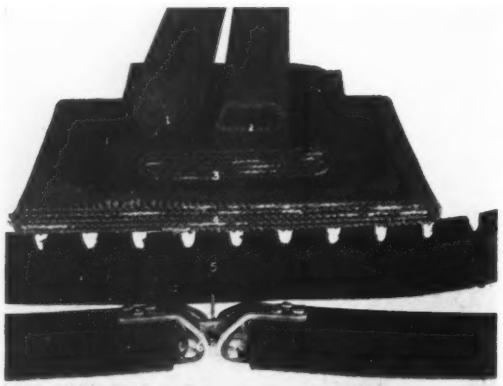

Fig. 1. Flat Belts and V-Belts Used by Army Ordance: (1) Double V-Belt; (2) V-Belt; (3) Drivebelt, Sandblast Table; (4) Drive Belt, Flat; (5) Variable Speed Belt; (6) Coupling, V-Belt

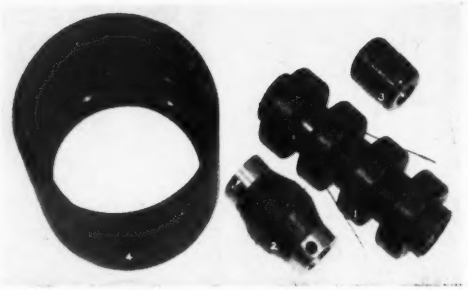

Fig. 2. Special Ordnance Rubber Parts: (1) Precompressed Rubber Bushing for Tank Track Shoes; (2) Rubber Bonded Coupling for Motor Connection; (3) Rubber Covered Metal Roll; (4) Grease Seal Retainer for Axle on Rocket Launcher

point of traction, self-cleaning, durability, and the elimination of excessive vibration. As the vehicles became heavier, it was obviously necessary to increase the ground contact area of the track shoes in order to maintain a reasonable unit pressure.

Moreover the heavier vehicles were provided with more powerful engines which could not propel the vehicles unless the traction of the tracks was increased. This situation necessitated that higher grousers be used, regardless of whether they were made of rubber or steel. For a given grouser height, a rubber chevron block is approximately half as heavy as a metal shoe of cast or forged design. When operating conditions call for military vehicles to traverse rocky terrain, track with steel road-contacting surfaces are usually indicated. Under most other operating conditions the rubber chevron track acquits itself admirably. Rubber chevron tracks will not accumulate ice or freezing slush, and they have considerably better traction on icy roads than do metal treads.

At present the service life of the rubber shoes is less than that of the rubber bushings. The rubber goods manufacturing industry, by cooperative engineering, is attempting, therefore, to improve the service life of our rubber chevron tracks. The postwar development of low-temperature polymer compounds has contributed much to this service life, and we now have synthetic rubber compounds whose performance is equivalent to that of the best natural rubber compounds we can formulate.

Tracks which have a metal tread surface are essentially intended for off-the-road operation. The metal shoes quickly pound highways to pieces, and in most states track laying vehicles shod with metal are legislated off the highways. The Army Ordnance Department has several tracks in current production which are provided with attachable grouser pads. On highways or solid ground the area of these pads is sufficient to provide a flotation for the vehicle so that excessive penetration does not occur. Also, these rubber grouser pads improve the traction of the vehicles on concrete or hard surfaced roads. The steering and braking characteristics of vehicles provided with rubber traction pads are much superior to those where steel surfaces are in contact with the pavement. The objective behind the attachable grouser pad was to give the military services a single track adaptable to either highway or off-the-road operation. There has not been too much field testing to date, however, to establish clearly whether the steel track with the rubber pad is superior to the rubber chevron track.

Item 2 of Figure 2 is a rubber bonded coupling used to transmit power from a source such as an electric

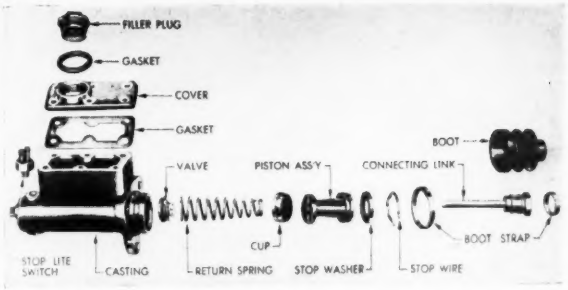

Fig. 3. Parts of Combination-Type Hydraulic Master Cylinders With Fixed Heads

motor. The rubber is extremely important in reducing torsional vibrations produced by misalinement of the prime mover and the driven equipment.

Item 3 of Figure 2 is a rubber covered metal roll.

Item 4 of Figure 2 is one particular design of a grease seal retainer for use around an axle on a rocket launcher.

Molded Parts Including Bellows, Bumpers, Etc.

Ordnance is interested in a variety of extraneous molded parts. One item of particular interest is a spark plug cover. At present, several designs are being tested for use on vehicles that ford streams. Most of these covers are made of neoprene because of the necessary resistance to ozone, weather, and oil in this application. Silicone rubber is also being used for spark plug covers.

There are many places around motors and machinery where rubber bellows are used. Experimental bellows have been fabricated at Rock Island Arsenal of plastisols on glass cloth, but this combination was easily penetrated by hot particles of unburned propellant during firing tests. Another bellows is now being constructed of brass mesh sandwiched between sheets of Neoprene FR rubber. Neoprene coated fiber thin cloth is another material currently being evaluated for use as axle boots. In Figure 3 is shown a breakdown of the master cylinder of a hydraulic brake system, indicating the various rubber parts such as gaskets, washers, and a boot. These boots were formerly made of natural rubber, but are being replaced by a 90/10 butadiene/styrene GR-S, specially compounded for good low-temperature performance. One of the annoying problems which occurs from time to time in connection with brake cups is the use of other fluids in the system, particularly petroleum oil, when the regular glycerine or castor oil type of brake fluids is not available. The use of petroleum oil in these brake systems soon produces a vehicle without brakes. Work has been in progress for some time to develop a cup with adequate low temperature and swell requirements in both petroleum and MIL-F-2111 fluid.

Axle bumpers are now being made of cold (LTP) GR-S. They must be compounded to be resistant to splitting and cracking on repeated impact.

Rubber Hose

As shown in Figure 4, many types of hose are manufactured, and Ordnance uses several types, including: air brake, radiator (coolant system), hydraulic brake, fuel and oil, high-pressure steam, vacuum brake, water, windshield wiper, heater, lubricating gun, hydraulic, gas, gasoline, spray, sulfuric acid, and water hose.

Recoil Seal Rings

Approximately six recoil seal rings are used in every gun recoil mechanism. In actual use the rubber seals are covered with a leather envelope or shroud. This prevents the seal from twisting and sticking in service. The seals must operate satisfactorily at —65° F. in contact with recoil fluids and under pressures up to 3,000 psi. Paracril 18 appears to be the preferred rubber for this particular application.

Seals, Packings, Grommets, O-Rings

In Figure 5 are pictured a variety of seals, packings, grommets, and "O" rings. In order to procure suitable gaskets of all types, Ordnance plans to adopt a general-purpose specification recently prepared by ASTM which covers all types of gaskets. This specification is now listed as ASTM D1170-51T. Various members of the rubber industry have been working on the preparation of this specification for approximately five years, and they have done a very good job.

Ammunition can gaskets (Figure 6) are usually made of GR-S. Not only must this-type gasket seal against air and water at all temperatures in the —65 to +160° F. range, but, in addition, must not adhere to the metal cover and make it difficult to open the can. Compression deflection and compression set properties in the proper range are important for compounds used in this application.

Torsion Bushings

Figure 7 shows one type of torsion bushing used for wheel suspension systems on artillery carriages. Either natural or GR-S rubber appears to be satisfactory for use in these torsion bushings.

Fuel Pump Diaphragms

Fuel pump diaphragms (Figure 8) are usually made of nitrile type rubber with a cloth insert. They must have good fuel and oil resistance and be flexible at low temperatures. One Ordnance problem with these diaphragms is their very short shelf storage life.

Obturator or Gas Check Pads

Obturator or gas check pads (Figure 9) are items generally unfamilar to most rubber technologists. These pads serve a very useful purpose in the breech mechanism of artillery pieces where they provide a seal by expanding under pressure against the breech opening. For many years gas check pads were of an inelastic type which could be remolded when warm and soft. These pads were composed of a mechanical mixture of tallow and asbestos fiber molded into proper shape and tightly covered with canvas. One constant problem with these

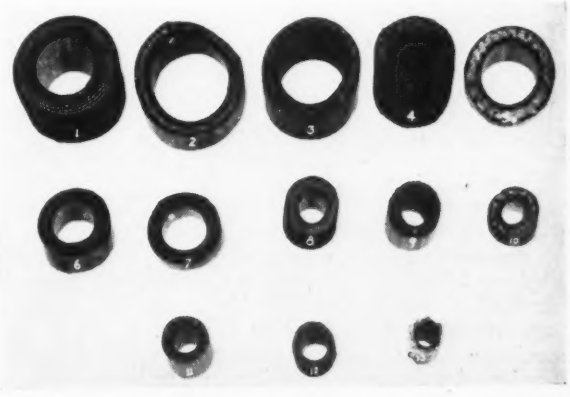

Fig. 4. Hose Types: (1) Steam; (2) Oil; (3) Water, Two-Ply; (4) Steam, Five-Ply; (5) Oil, Static Wire Type; (6) Gas and Oil Proof, Two-Ply; (7) Gas and Oil; (8) Air, Four-Ply. (9) Water, Three-Ply; (10) Gas and Oil; (11) Air; (12) Water, Two-Ply, Thin Wall; (13) Gasoline and Oil Proof

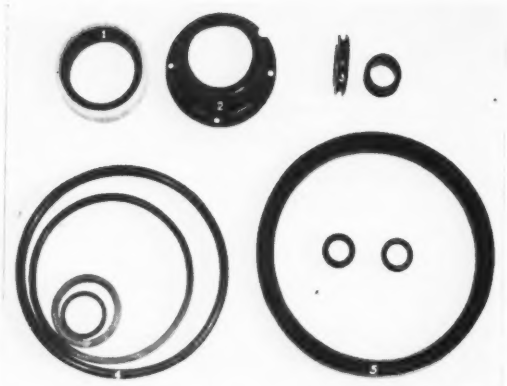

Fig. 5. Seals, Packings, Grommets, and O-Rings: (1) Floating Piston Packing, Telflon and GR-S; (2) Seal, Telescope; (3) Grommets; (4) "O" Rings; (5) Chevron Packings

Obturator for shell, HE, 65 mm., is made of two pieces bonded together. The shell seats into the cup shape, made of a hard phenolic resin-nitrile rubber compound, while the back part is made of a softer vinyl resin-nitrile rubber blend. (See Figure 11.)

Gaskets for use in calorimeter bomb test equipment, a "one shot" item that must withstand high pressure, is made of "Polyblend." A GR-S composition is used for "O" rings for the T63E5 FD fuse.

An item called an "ionization pick-up connector" is used in various pieces of test equipment as a means of introducing lead-in wires through an insulation medium. Although made of quite a hard stock, a slight rubbery nature allows a press fit. Since no conductive carbon black is used, hardness is provided by a high styrene copolymer, 80 parts of which are milled with 20 parts of GR-S for the compound used in this item.

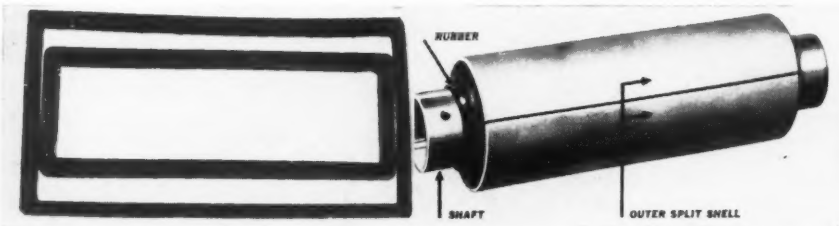

Fig. 6. Two Types of Ammunition Can Gaskets

Fig. 7. One Type of Torsion Bushing for Wheel Suspension Systems

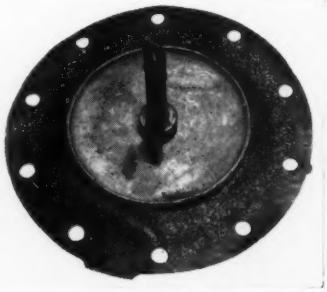

Fig. 8. Fuel Pump Diaphragm

pads results from shrinkage at low temperatures and loss of sealing pressure. Several designs of pads are currently being tested to solve this problem. To date, however, no design has been found which is entirely satisfactory at both high and low temperatures. It should be mentioned that surface resistance is also required against abrasion, chemicals, water, and oils. The current pad is made of neoprene and a heat resistant filler in accordance with Watervliet Arsenal Specification WVXS-101.

Sponge Rubber

Sponge rubber is used on Ordnance vehicles as padding, weatherstripping, and seating and also for heat insulation. In addition, Ordnance has many sponge applications in packaging for shock insulation. The vinyl-type sponge is gradually becoming popular by virtue of its light weight, oil and flame resistance. Vinyls are currently being used as thermal insulation on vehicles intended for Arctic service.

Some Special Rubber Items

Figure 10 demonstrates a specialty use of molded rubber in current development work to improve the M-1 or Garand rifle. The forearm grip and the stock are presently made of walnut wood, which is in short supply and heavy and expensive. In addition, the wood becomes hot to touch when the rifle is fired continuously. Tests to date on molded rubber (Paracril A) over thin aluminum sheeting are very encouraging for this application. Another use of rubber and rubber-like materials in small arms is the dust cap for cartridge clips which is made of either Paracril A or vinyl plastisol.

GR-S used with 100 parts of medium thermal carbon black to 100 parts of rubber has proved best for shell positioning rings.

Crimping Rings and Nozzle Closures

Neoprene crimping rings of four sizes are made from stock with a durometer hardness of 90 ±5, and are going into use on production lines to crimp shell case to projectile for 37, 40, 75, and 76 mm. sizes. Rubber rings have given in excess of 10,000 crimps without breakdown. (See Figure 12.)

Nozzle closures for JATO rockets (Figure 13) are a considerable problem. This piece is unique in that a steel washer, which is molded into the closure, acts as a reinforcement to the otherwise flexible GR-S rubber piece. The closure is supposed to withstand a certain pressure before blowing out. To date, no firing results have been received.

A rubber nozzle closure made of GR-S of about 35 durometer hardness with ignition wires molded in was the first type of closure used on the 2.36-inch rocket. The undercut in the piece fits the nozzle to give a tight seal. The nozzle closure in the 2.36-inch rocket has a certain blowout pressure, just as does the Jato closure. The latest modification of this item is made without wires and with the inner core reduced to cut down mass and consequent lethality. The wires are now pushed in through the soft rubber.

Pressure plate ring, Mine, AT, Light, M7, is a GR-S composition. The ring is used as a pressure plate. It "gives" when the tank runs over a mine and also acts as a waterproof seal.

Ignition Cable

The conventional type of ignition cable for automotive vehicles does not work well in the Arctic. The least movement or jarring at —65° F. causes the insulation to snap and break. The recently developed silicone covered ignition wire, currently purchased under MIL-C-3162, seems to be solving this difficulty.

Fig. 9. Obturator or Gas Check Pads

a contractural basis with Firestone Tire & Rubber Co. This phase has been concerned with the aging of rubber by air, oxygen, ozone, heat, and light. Much basic information has been gathered. In addition a specification, based on the oxygen absorption of rubber materials, has been developed. It is anticipated that this specification, when used with standard rubber aging tests, will provide valuable supplementary information regarding rubber material.

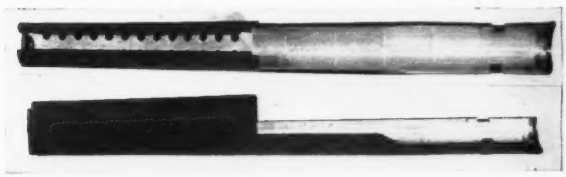

Fig. 10. Rubber Forearm Grip, M-1 or Garand Rifle

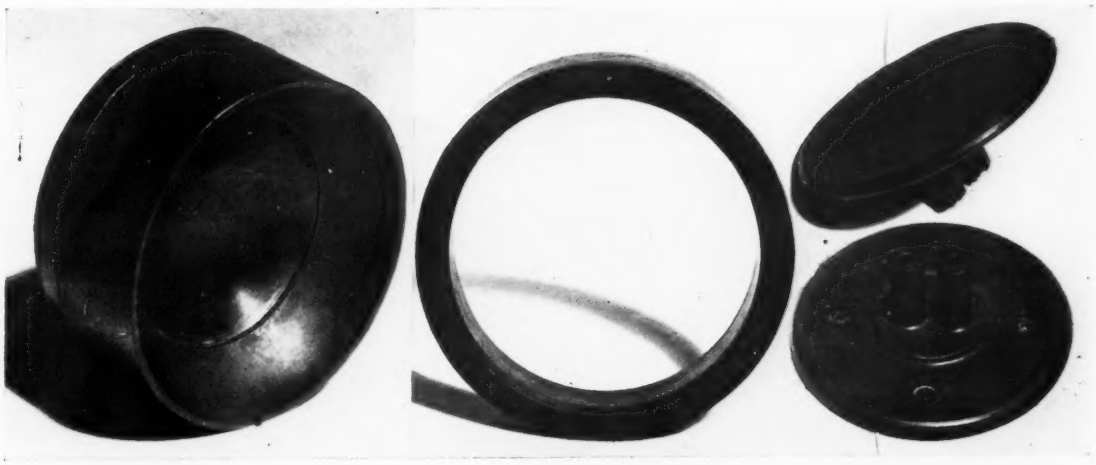

Fig. 11. Obturator for HE, 65 MM. Shell

Fig. 12. Crimping Ring for Shell Projectiles

Fig. 13. Nozzle Closures for Jato Rockets

Coated Fabrics and Sealants

A project is under way at Picatinny Arsenal to develop protective tarpaulins for tanks while in transit and storage. Supported films of both rubber and plastic are being evaluated in field tests, and future action will depend upon the results of these tests. If they prove successful, it is hoped adoption of these materials will overcome difficulty in obtaining and using the presently specified heavy duck.

Ordnance uses large quantities of "Thiokol" sealants in waterproofing tanks and automotive vehicles and for sealing optics in artillery fire control mechanisms. With the advent of pronounced shortages of "Thiokol" during the past year, a program was initiated to investigate the suitability of other sealants for the above-mentioned applications. Results of tests to date indicate that low molecular weight polyisobutylene sealants are satisfactory for waterproofing tanks and automotive vehicles, which will result in a money saving. No satisfactory sealant has been found, however, to replace "Thiokol" for use with artillery fire control instruments.

Ordnance Research and Development Program

I have reserved the final portion of this talk for a summary of Ordnance research and development pertinent to mechanical rubber goods. The mechanism and the retardation of aging in rubber items are of vital importance to the Ordnance Corps. One phase of the Ordnance program involving aging is being conducted on

Work is also under way at the Augustana Research Foundation to identify some of the breakdown products of GR-S rubber on aging and to explain the action of several anti-ozone agents in retarding this breakdown action. New and improved anti-ozone agents are being synthesized for use in Ordnance materials and are being tried out by the rubber laboratory of the Rock Island Arsenal.

A program dealing with the evaluation of commercially available preservatives and preservatives formulated at Rock Island Arsenal has been an important task for approximately three years. A procurement specification has recently been prepared based on those preservatives which have proved the most suitable as a result of the test work. The preservatives are necessary to protect Ordnance rubber items, such as tires, bogie wheels, and tank tracks. Since the amount of available indoor storage space is limited and particularly so in times of national emergency, it is vitally necessary to employ preservatives to extend or conserve the service life of items stored outdoors.

A need also exists of an electronic instrument automatically to measure and record low concentrations of atmospheric ozone. Such an instrument would be of value in interpreting rubber outdoor exposure results. A contract for the development of such an instrument has been awarded to the National Bureau of Standards,

(*Continued on page 226*)

Recent Developments in the Chemistry of Rubber

B. L. Johnson[1]

THIS brief review of interesting developments in the chemistry of rubber during 1950 and 1951 will emphasize studies made in an effort to understand polymer formation and structure, vulcanization and reinforcement. In recent months, research has been most active in studies made in an effort to understand the reactions involved in these fields of polymer chemistry.

Polymer Structure

A more complete knowledge of the mechanism of formation of natural rubber would undoubtedly be useful to those engaged in problems of synthetic rubber structure. Therefore the investigations on rubber formation in guayule (1)[2] by means of acetate labeled with isotopic carbon have a dual interest. These investigations reveal that acetate is metalbolized by guayule through several pathways of which synthesis to rubber is of only minor importance compared to the synthesis to resins and amino acids. Also of interest in connection with mechanism of rubber formation is the finding that the latex of untapped trees and of branches remote from the tapping panel of trees in regular tapping contains a high proportion of microgel (2).

In the field of synthetic rubber structure studies, permanganate oxidation of polybutadiene (3) has been used to obtain results which corroborate the general thinking that lowered polymerization temperature produces a more regular, less branched polymer. Polymer chain dimensions, which depend on structural regularity, can now be estimated by means of intrinsic viscosity-temperature relationships (4). Details have recently been published of the convenient refractive index method (5) which has been employed in the government owned synthetic rubber plants for several years for the determination of bound styrene in butadiene-styrene copolymers.

Vulcanization

New techniques have been introduced in the study of the chemistry of vulcanization. For instance, experiments with radio sulfur (6) have shown that isotopic sulfur atoms of tetramethyl thiuram disulfide molecules were distributed uniformly among the products of short path distillation of a vulcanizate containing the radioactive curing agent. Data support the concept that vulcanization, including that with elemental sulfur, is a type of polymerization.

A physical chemical approach for the evaluation of vulcanization in butyl rubber (7) has indicated that the amount of organically combined sulfur remains fairly constant at a value of two atoms of sulfur per cross-link up to the point at which reversion sets in.

Organic sulfides, less scorchy vulcanizing agents (8), reported during the year, have a timely interest as it becomes desirable to process higher Mooney viscosity polymers or compounds which contain more active blacks.

Reinforcement

The past year has seen increased activity in the field of the study of the mechanism by which carbon blacks reinforce polymers. A paper on the thermodynamics and mechanics of reinforcement (9) presents a review of earlier theories of pigment reinforcement and derives a reinforcement equation by combination of thermodynamics and the elasticity theory of large strains.

The presence of highly pigmented carbon gel in high-temperature mixes of low-temperature polymer has been confirmed in electron photomicrographs of tread compounds (10). The contribution of these highly pigmented units to reinforcement is measured in terms of increased modulus and improvement in tread wear. The formation of this bound rubber has also been investigated from the standpoint of the structure of the polymer (11). It was shown that polymer of higher molecular weight is preferentially bound during mill mixing, and that polymer of progressively lower molecular weight is bound as the black loading is increased.

Calorimetric measurements (12) reveal that the surface of carbon black contains sites that react with bromine to liberate the same amount of heat as do low molecular weight olefins. The presence of these reactive sites suggests the possibility of strong bonding of a chemical nature. The existence of weak and strong bonds in carbon-rubber networks has been demonstrated (13) and experimental estimation of their relative strength has been made. It has been concluded that most of the carbon-rubber bonds are of low energy (van der Waals') type, but that a relatively small number of strong bonds exist, and these strong bonds stiffen the rubber at high elongations.

Still another method for comparison of the strength of pigment-polymer bonds is the determination of the modulus of vulcanizates in the swollen state (14). The carbon black-polymer bond is sufficiently strong to persist even while the network is in the swollen state; while weak bonds between polymer and a mineral filler (equal to the black in average particle diameter) are destroyed by the swelling action of the solvent.

Tracer techniques may prove of value in obtaining a better understanding of polymer-pigment interaction in the future. For this purpose a simple, laboratory method (15) has been developed for preparation of radioactive carbon black. Studies of dispersion and agglomeration of this black in rubber have shown visible variations in dispersion which agree with tensile strength data.

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Tire Industry

J. H. Fielding[3]

THE year 1951 was a big one for the tire industry. A recent syndicated article pointed out that the first 11 tire companies had increases in sales of from 14 to 81% over 1950 figures, and that one of these companies had sales in excess of one billion dollars. Admittedly this business was not all in tires, but the major business of these companies is tires. The profit picture also was good since the ratio of profits to sales varied from a low of 2.8% to a high of 5.6%.

Shortages and Restrictions

Strangely enough, 1951 was, at the same time, a year of shortages and restrictions. Because of the impact of the Korean War which emphasized the need of an adequate stockpile, and because the synthetic rubber industry had been allowed to retrench prior to the Korean War, it was necessary for the government to place rather drastic controls both on the quantity of civilian business and upon the end-use to which both natural and synthetic rubber were put.

In late 1949 and early 1950 the price of natural rubber sank to a level below the price of synthetic. The government R-1 order controls were very loose, and for reasons of competition, crude natural rubber replaced synthetic rubber to a very large extent. With a sharply rising price of natural during 1950 this trend was reversed so that at the beginning of 1951 the then current M-2 order (December 11, 1950) was not at all realistic. It required a certain minimum use of synthetic rubber, but it is certain that all consumers were using much more than this because of economy. M-2 was revised and supplemented and finally reissued March 1, 1951, on an entirely new basis fixing maximum civilian production and reducing the permitted use of natural rubber in tires to a very low, but nevertheless efficient level. This level was not so low as that reached during World War II, but in 1951 there was no restriction on vehicle speed such as there was during World War II. The restrictions on end-product use remained substantially unchanged for the balance of 1951, but quantity of civilian production was allowed to increase slightly.

At the same time as the March, 1951, M-2 order the government became the sole buyer and seller of natural rubber. The stockpiling program as well as the demand of industry had pushed the price of rubber above 80¢ a pound, but by the end of 1951 there were prospects of ample supplies of natural rubber at less than half of this figure.

Among the restrictions on end-use was a provision limiting the lines of tires which might be made. White sidewall tires were prohibited. Second-line tires were prohibited. Premium and special-purpose tires were limited. During the year, restrictions were relaxed to permit the production of second-line tires and later to make everything except white sidewall tires. The latter restriction was not lifted until March, 1952.

The restriction on white sidewall tires brought about several new methods of reconditioning tires to give them a white sidewall appearance. These methods involved the use of white plastics or white paints which were applied by people other than the tire manufacturers.

The effect of restriction and price upon the tire manufacturer during this time was to force him to use more synthetic rubber than he had been accustomed to in recent years. This fact, plus the high production of civilan and military products in 1951 permitted the synthetic rubber industry to produce an all-time high of 845,155 long tons. As restrictions are being lifted, there will, of course, be a higher proportion of natural rubber used because of white sidewall tires. But, on the other hand, prices are still in favor of synthetic rubber and with the probability of considerable competition in the industry, there is no doubt but that the use of synthetic rubber will remain very high.

Cold rubber is not a 1951 development, but its importance is such that during 1951 cold rubber was placed on allocation so that companies which had been using a large amount of cold rubber were forced to reduce their take in order to share with other companies. The production of cold rubber was increased so that by March, 1952, it was possible to increase the allocation to 50% of the total GR-S.

New Rubbers and Compounding Ingredients

As the synthetic rubber industry expanded in 1950, it first encountered a shortage of styrene resulting from a world shortage of benzene. The reduction in styrene content of all cold rubber which started in 1950 has been proven to produce a satisfactory product and has been continued. A similar reduction has not been acceptable in hot rubber. In the same period of styrene shortage, there was a temporary, but highly successful use of low-temperature polybutadiene, in both treads and carcasses.

As capacity to produce synthetic rubber increased, it became important to conserve all critical materials, and oil masterbatches came into the spotlight. They were in increasing use during 1951. They permit the holding of quality while using higher amounts of oil and black than were heretofore considered proper. Although these masterbatches were first of interest because of a saving in critical materials, it seems apparent that interest will be continued because of substantial economies brought about through their use.

[3] Vice president, Armstrong Rubber Co., West Haven, Conn.

Among other compounding materials there has been a general interest in the super abrasion type of furnace black. Although not in general production, all producers have been active in the field on a semiproduction basis. High abrasion furnace black has continued to be important so that it is now second only to channel black in its use. Several new non-staining antioxidants have come into production and have found favor both in compounding and as stabilizers for synthetic rubber. Two scorch resistant accelerators of the sulfeneamide type have created considerable interest.

Rayon for tires has been in short supply and has been subject to allocation much the same as synthetic rubber. This shortage has brought about increased use of cotton in passenger tires at considerable expense to the tire manufacturer. Nylon has been increasing in its use, and tires of better quality, having less growth, have been made possible through prestretching and setting nylon.

New Tire Designs

The restrictions in lines of tires have unquestionably retarded the introduction of new designs. There has been some increase in the use of sipes, stone ejectors, and bumpers. There has also been a trend toward the lug type of design for highway truck use. As white sidewall tires return to production, we see further evidence of various types which tend to resist curb-stone scuffing. As other lines and products become possible, we see a further trend toward tires or tubes or combinations of the two having blowoutproof or puncture-sealing features.

Manufacturing Methods

Manufacturing methods do not change very fast, and no one year can see the completion of any project. The year 1951 appears to fall in the middle of a complete revision in curing methods brought about by the Bag-O-Matic press. A second manufacturer of this type of press has come into the field. Large presses have been produced to extend the scope of this type of equipment through 11.00 truck tires. An automatic press having a piston-type mold has been put into use in several companies which permits efficient manufacturing of the bladder for the Bag-O-Matic press. It is certain that the conversion to this type of curing will continue.

Army Ordnance Goods

(*Continued from page 223*)

where a study will be made of the transmittance of radiant energy from a light source (for example, the 2537 A mercury line) through a limited air path, and a record made of variation through the use of electronic equipment as phototubes, amplifiers, and recorders.

Promising terpolymers are being considered for use in rubber items exposed to low temperatures. Terpolymers consisting of butadiene/isoprene/styrene are presently being used to fabricate experimental tank tracks, tank track blocks, tank bogie wheels, and automotive fan belts. These items are being evaluated during cold temperature environmental tests conducted this winter at Devils Lake, N. Dak., and will be compared against production items manufactured of cold GR-S rubber.

As they become available, new polymers and formulating ingredients are evaluated for suitability for Ordnance applications. Of particular interest in this screening program is resistance to fuels, oils, light, ozone, heat, and performance at low temperatures.

A very definite need exists of a testing machine to evaluate performance characteristics of pneumatic tires without resorting to expensive "on the road" testing by fleets of vehicles. It is true that many tire manufacturers now have indoor tire testers of varying design, but these testers yield only an indication of changes in the tire carcass, and such important properties as tread wear and cut growth cannot be adequately determined by present-day testers of this type. The development of an improved type of indoor tire tester has been under consideration by Ordnance since 1948. Since most of the present indoor tire testers are modifications of an original design by NBS, the Ordnance Corps has been doing some preliminary planning with this agency in connection with the development of an improved tester.

Presently available methods for the determination of the characteristics of rubber compounds at low temperatures are generally unsatisfactory for correlation with service data. Accordingly, much effort is being expended to evaluate newly developed tests. At a meeting held March 5, 1952, rubber engineers of the Department of Defense agreed that the following methods would be used in military procurement specifications: (1) for hardness testing—the Pusey & Jones or Admiralty Tester, as outlined in Federal Specification ZZ-R-601; (2) for brittleness testing—ASTM Method D746 (motor or solenoid); (3) recovery of elastomers—compression set, temperature-retraction, and tension recovery; (4) stiffness testing—Gehman torsion tester.

Government and Industry Cooperation in Ordnance Program

In conclusion, it should be mentioned that the Ordnance rubber development work has received and is receiving substantial assistance from industry in an advisory capacity. Ordnance continually invites the cooperation of industry and relies heavily for advice on the following committees: (1) ASTM Ordnance Advisory Committee; (2) Tire & Rim Association Ordnance Advisory Tire and Rim Committee; (3) RMA Ordnance Advisory Mechanical Rubber Goods Committee; (4) SAE Ordnance Advisory Track and Ordnance Advisory Bogie Roller Committee; (5) ASTM Committee D-11 on Rubber and Rubber-Like Materials; (6) SAE-ASTM Technical Committee on Automotive Rubber.

Besides the above committees, Ordnance maintains liaison representation on working committees of various national technical societies, including Society of Automotive Engineers, American Society for Testing Materials, and American Chemical Society.

It is only by means of this teamwork, cooperative effort, and continuous exchange of research findings between the various government agencies and industry that the progress reported in this paper has been possible. It is hoped that the discussion of Ordnance needs and problems in connection with special-duty rubber items has provided rubber technologists with some new information and has indicated how, with the help of industry, Ordnance is going about developing new items to meet the everchanging conditions of modern global warfare. The problems involved are important and will continue to require utmost efforts from all concerned.

The authors wish to acknowledge the assistance of R. F. Shaw, rubber laboratory, Rock Island Arsenal, Rock Island, Ill., and L. Gilman, plastics laboratory, Picatinny Arsenal, Dover, N. J., and those rubber companies who aided materially in submitting information for inclusion in this paper and also in reviewing it.

A Study of Various Low-Temperature Test Procedures—I[1]

A. F. Helin[2] and B. G. Labbe[2]

FOR the past four or five years many of the rubber testing laboratories in the United States have been confronted with the problem of selecting a test procedure which would enable them to choose the best rubber or polymer compound for low-temperature properties. Although each of the test methods investigated has a specific usefulness, many of them seem to have one or more of the following disadvantages:

1. Time required for the test is excessive.
2. Crystallization of the material is not detected.
3. Test results are not reproducible.
4. Cost of the apparatus is excessive.
5. The operation is too difficult.

Recently the Synthetic Rubber Division, Reconstruction Finance Corp., confronted with conflicting opinions regarding the performance at low temperature of various polymer compounds, requested four laboratories to participate in a comprehensive program to study the relative merits of the principal methods used for evaluating low temperature properties. Phillips Petroleum Co., the Bureau of Ships (Material Laboratory, New York Naval Shipyard), the United States Rubber Co., and the RFC Government Evaluation Laboratories cooperated in examining 12 polymer compounds to evaluate the available methods for low-temperature testing and to attempt to correlate the data obtained by the several test procedures. It was believed that a comparison of results by several different methods and, also comparisons of results by identical methods at different laboratories would provide data from which a valuable critical study of test methods could be made. The testing methods included the following:

1. Temperature-retraction.
2. Low-temperature extension.
3. Gehman low-temperature flexibility.
4. Compression set.
5. Clash-Berg torsion test.
6. British Admiralty hardness test.
7. Stress-relaxation test.
8. Shore A hardness.
9. Rate of retraction.

Phillips conducted tests 1, 2, 3, 4, 8, and 9. Material Laboratory ran tests 4, 5, and 6; while U. S. Rubber ran 1 and 4; and the government laboratory, 3, 4, 7.

The nine polymers selected to be mixed in a standard recipe were:

1. Natural rubber.
2. GR-S (X-539) polymerized at 122° F.[3]
3. Emulsion polybutadiene made at 122° F. (XP-148).[4]
4. Emulsion polybutadiene made at 14° F. (XP-169).[4]
5. Sodium-catalyzed polybutadiene.[4]
6. Sodium-catalyzed 75/25 butadiene/styrene.[4]
7. Perbunan 26.[5]
8. Emulsion 85/15 butadiene/styrene made at 122° F. (XP-138).[4]
9. Emulsion 80/8/12 butadiene isoprene styrene made at 41° F.[6]

GR-S, 85/15 butadiene/styrene, and Perbunan 26 polymers were also compounded in accordance with special gasket recipes.

To avoid variables caused by compounding techniques, the specimens to be tested were compounded and cured by a single organization, the Government Laboratories (recipes are shown in Table 1). The stress-strain properties of the compounds were determined over a range of five cures (see Table 2). As judged by the 300% modulus values, optimum curing times were selected, and each specimen for the low-temperature tests was vulcanized for approximately 15 minutes longer than its selected optimum curing time.

Description of the Test Methods

A brief description of the methods that were applied in this study follows:

Temperature-Retraction

The T-R test method, as conducted at Phillips Petroleum,[7] determines the rate of retraction of a test specimen elongated 50% at room temperature and immediately chilled in an acetone-dry ice bath to minus 70-75° C. After three minutes one end of the specimen is released and allowed to retract as the bath is warmed up at a rate of 1° C. per minute. Tests were conducted on unconditioned specimens and on specimens preconditioned for 22 hours at 35° F. and for 72 hours at 0° F.

In the T-R method utilized at U. S. Rubber,[8] higher initial extension (250%) is employed. The elongated sample is immersed in a methanol-dry ice bath and conditioned for 10 minutes. The test procedure otherwise is identical with that followed by Phillips; in the rubber company method, however, readings of the temperature are recorded when the test specimen shows 10, 30, 50, and 70% retraction of the amount of stretch.

Low-Temperature Extension

The percentage elongation of a two-inch T-50 specimen is measured 30 seconds after the application of a 2.02-pound weight.[9] This procedure is repeated on the same sample over a range of temperatures for specimens conditioned for one minute at each temperature prior to application of the load. The percentage extension or elongation then is plotted against the temperature in degrees Centigrade, and the curve is extrapolated to zero extension, which is represented as the freeze point.

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[1] The work reported herein was carried out under the sponsorship of the Synthetic Rubber Division, Reconstruction Finance Corp., in connection with the government synthetic rubber program.

[2] Government Evaluation Laboratories, University of Akron, Akron, O.

[3] Control GR-S made at the Goodyear, Torrance, Calif., plant of the Synthetic Rubber Division.

[4] Made at the Government Laboratories.

[5] Obtained from Enjay Co. (Now available from U. S. Rubber, Naugatuck Chemical Division.)

[6] Made at the government laboratory; polymerization formula suggested by U. S. Rubber.

[7] J. F. Svetlik, L. R. Sperberg, India RUBBER WORLD, May, 1951, p. 182.

[8] O. H. Smith *et al.*, *Anal. Chem.*, 23, 322 (1951).

[9] Private communication to Synthetic Rubber Division, RFC, by Phillips Petroleum.

TABLE 1. COMPOUNDING RECIPES (PARTS)

	1 Natural Rubber	2 GR-S (X-539)	3 122° F. PolyBD (XP-148)	4 14° F. PolyBD (XP-169)	5 Na PolyBD 81PC4-6	6 Na 75/25 BD/S	7 Perbunan 26	8 85/15 BD/S (XP-138)	9 80/8/12 BD/I/S
Polymer	100	100	100	100	100	100	100	100	100
Statex B	40	40	40	40	40	40	40	40	40
Zinc oxide	5	5	5	5	5	5	5	5	5
Sulfur	3	2	2	2	2	2	1.25	2	2
Altax	0.75	1.75	3	3	1.25	1.25	1.75	3	3
Stearic acid	3	.....	1.5	1.5	3	3	.....	[1]1.5	1.5
PBNA	1.5	.....	.....	.....	.....	.....	.....	.....	.....
Final weight	153.25	148.75	151.5	151.5	151.25	151.25	148.00	151.5	151.5

Special Gasket Recipes

	10 GR-S (X-539)		11 85/15 BD/S (XP-138)		12 Perbunan 26
Polymer	100	Polymer	100	Polymer	100
Philblack A	40	Statex B	75	Statex B	75
Zinc oxide	5	Zinc oxide	5	Zinc oxide	5
Heliozone	1	Plastolein 9050	10	Adipol BCA	10
Flexol TOF	20	Dicapryl sebacate	10	Dibutyl sebacate	10
Methyl tuads	0.8	Stearic acid	1	Plasticizer 3425	10
Sulfur	1	Methyl tuads	1	Stearic acid	1
		Sulfur	1	Thionex	0.3
				Sulfur	1.5
Final weight	167.8		203		218.8

Gehman Low-Temperature Flexibility

The Gehman apparatus and test procedure have been described fully by S. D. Gehman.[10] The flexibility of a test specimen is determined through a range of temperatures by twisting an assembly composed of the test specimen and a torsional resistance wire through an angle of 180 degrees. The angular twist of the test specimen is noted in degrees; the remainder of the 180 degrees represents the twist of the torsion wire. When the readings of angles of twist are plotted against the corresponding test temperatures, a sigmoid curve is formed which usually has a sharp break at a low temperature. The "freeze point" is the temperature indicated at the intersection of the abscissa (zero degrees of twist) and the extended straight-line portion of the sigmoid curve. The temperatures are calculated at which the specimen is 2, 5, 10, and 100 times as stiff as it is at 25° C.

Phillips Petroleum used the commercial Gehman instrument marketed at the present time. The Material Laboratory modified a commercial Gehman instrument to test one specimen at a time and enclosed the entire assembly in a cold chamber. The Government Laboratories used a specially constructed instrument which holds 10 specimens in a test rack and is cooled not by carbon dioxide, but by means of nitrogen gas obtained by evaporation of liquid nitrogen. Means are provided also for agitating the coolant in the test chamber.

Compression Set

The constant deflection procedure (ASTM D395-40T, Method B) was followed. The Material Laboratory, U. S. Rubber, and the Government Laboratories used 40% deflection; whereas Phillips used 25 and 35% deflection during the compression period. Phillips conducted tests for two hours at 212° F., 22 hours at 35° F., 94 hours at 35, and 72 hours at 0° F. The Material Laboratory ran 94-hour tests at 20, —20, —35, and —50° F.; while the rubber company and the Government Laboratories ran 94-hour tests at 35° F.

Clash-Berg Torsional Stiffness

The principles of the Clash-Berg[11] and the Gehman instruments are almost identical, and both of these test the flexibility of the test specimen by measuring the angular twist over a range of temperatures. The Clash-Berg apparatus provides actual flexural modulus values by application of a dead-weight load to obtain the angle of twist. The load required to obtain between 180 to 360 degrees of twist is determined at room temperature. That load is then applied to the specimen at each test temperature, and the degrees of twist are noted. From these data the apparent modulus of rigidity is calculated for each test temperature.

U. S. Rubber applies varying loads to obtain a constant degree of twist at each temperature.

Material Laboratory Hardness Test

The Material Laboratory Admiralty hardness tester[12] is similar to the Pusey & Jones and the ASTM-Tinius Olsen hardness testers; it applies a deadweight load on an indentor stem which has a ⅛-inch diameter hemispherical tip. The minor load is 90 to 100 grams, and the major load is 1,000 grams. The tester includes a small vibratory motor which tends to eliminate inaccuracies due to friction in the dial gage assembly. Readings are taken from a dial (with 0.01-millimeter divisions) superposed on the indentor stem.

Specimens were conditioned for 94 hours at 75, 20, —20, —35, and —50° F., at which times measurements were made 15 and 60 seconds after application of the major load.

[10] S. D. Gehman, D. E. Woodford, C. S. Wilkinson, Jr., *Ind. Eng. Chem.*, 39, 1108 (1947)
[11] R. F. Clash, Jr., R. M. Berg, *Ibid.*, 34,1218 (1942).
[12] British Standards Institution, Method No. 903-1940.

TABLE 2. STRESS-STRAIN TESTS AT 77° F.

	Min. Cured at 292° F.	Natural Rubber*	GR-S	122° F. PolyBD	14° F. PolyBD	Na PolyBD	Na 75/25 BD/S	Perbunan 26	85/15 BD/S	80/8/12 BD/I/S	Special Recipe GR-S	Special Recipe 85/15 BD/S	Special Recipe Perbunan 26
300% Modulus, psi.	30	1090	840	950	1390	570	600	810	950	1460	920	1070	1560
	60	1300	1140	1000	1470	900	990	1070	1090	1540	940	1100	1700
	90	1270	1260	1040	1560	1040	1240	1230	1150	1600	970	1100	1820
Tensile strength, psi.	30	4280	3180	1430	2190	1580	2380	2740	1670	2190	1480	1700	2680
	60	4140	3030	1410	2030	1320	2390	2630	1790	1940	1560	1590	2270
	90	3970	2670	1150	1670	1530	2150	2620	1790	2330	1460	1750	2240
Elongation, %	30	640	660	390	390	540	690	580	440	390	430	440	430
	60	590	550	380	360	370	540	490	410	360	430	410	360
	90	580	490	320	310	380	430	440	400	380	410	420	340

*Cured at 280° F.

Stress-Relaxation

The stress-relaxation equipment[13] measures, on a Foxboro-Dynalog, the actual pressure that a compressed test specimen exerts on a strain gage. The test specimen is placed between two anvils and compressed by means of a crank and gear arrangement. The distance between the anvils is registered by the combination of a revolution counter (one revolution represents 0.01-inch) and an indicating dial (each graduation represents 0.001-inch). The automatic recording instrument provides a means for observing the actual pressure at any time during the test.

Separate test specimens are compressed 40% at 35° F., and after periods of 2, 22, or 94 hours the anvils are opened by 2% of the original height of the test sample. The pressure immediately drops, and, as the sample recovers, the increased pressure is noted as percentage recovery of the decrease in pressure which occurred on separation of the anvils. Tests were made also for two-hour compression periods at temperatures of —20, —50, and —60° F.

Shore A Durometer Hardness

The standard Shore A durometer (ASTM Designation D676) was utilized for testing the samples at 80° F. and after conditioning for 22 hours at —35° F.

Rate of Retraction

A four-inch T-50 specimen is elongated 50% of its original length and is conditioned for the desired time at the test temperature. One end of the specimen then is released, and the retraction at definite time intervals is noted. This test is sometimes called a "tension-recovery" test.

Application of the Test Data

For discussion, the tests are divided arbitrarily into two categories; that is, those from which a freeze point may be determined and those which are commonly used to determine other properties at a specified temperature.

TABLE 3. FREEZE POINT AND RETRACTION VALUES, MINUS °C.

Polymer	Government Laboratories Gehman F.P.	Phillips Gehman F.P.	Phillips T-R F.P.	Phillips Extension F.P.	U. S. Rubber TR10	U. S. Rubber TR70
1 Natural rubber	58	59	56	61	56	15
2 GR-S	49	50	47	51	48	37
3 122° F. polyBD	73	76	72	72	71	53
4 14° F. polyBD	67	70	..	71	56	15
5 Na polyBD	42	43	40	43	42	32
6 Na 75/25 BD/S	26	26	24	25	26	15
7 Perbunan 26	31	30	28	31	29	20
8 85/15 BD/S	61	62	59	62	61	49
9 80/8/12 BD/I/S	59	60	56	60	59	48
10 GR-S*	64	64	61	63	63	47
11 85/15 BD/S*	71	71	69	70	70	54
12 Perbunan 26*	52	48	48	51	49	36

*Mixed in a special gasket recipe.

Gehman, Clash-Berg, Temperature-Retraction, and Extension Tests

The freeze points of the test polymers were determined at the Government Laboratories by the Gehman test and at Phillips by the temperature-retraction (T-R) test, the low temperature extension test, and the Gehman test (see Table 3). The results of the T-R tests obtained by U. S. Rubber do not determine the freeze point, but rather are indicative of crystallization in addition to establishing the low-temperature properties of the stock under the test conditions. The Gehman tests at Phillips and the Government Laboratories were conducted by identical procedures with the same type of apparatus and may be compared directly. The agreement among the freeze points, as determined by the four tests, is excellent; the deviation exceeded 4° C. in only one case, where the deviation was 5° C. The agreement between the two sets of Gehman data is especially good; the freeze point values check within 1° C. in nine of the 12 cases and the maximum difference is only 4° C. The relative stiffness values for Gehman data obtained at the Government Laboratories are shown in Table 4.

Although it is not evident from the freeze point data of the unconditioned samples alone, the 14° F. polybutadiene is a readily crystallizable material. Therefore the "freeze point" of this polymer is of doubtful value in establishing its serviceability at low temperatures without considering supplementary data which would disclose the crystallizing tendencies of the stock. The T-R (50% elongation) test data indicate this tendency clearly, since examination of the plot of percentage retraction *versus* temperature reveals a curve of significantly different shape from that of any other polymer. The sluggish retraction of this 14° F. polybutadiene was represented by a T-R plot with a steadily curving line which could not be extrapolated satisfactorily to determine a freeze point (Figure 1). Although the much lower slope of the Gehman curve for this polymer is different from the Gehman curves for the other polymer compounds, it has not been definitely established that this peculiar type of curve is indicative of crystallization. This particular curve also exhibits a break, probably caused by a transition point at about 50° C., which has been noted in previous experiments with polybutadiene made at 122° F. and with low styrene polymers made at 41° F. (see Figure 2).

Although the Gehman procedure is not advocated as a means for the determination of crystallization, it appears that an easily crystallizable stock may be detected by this apparatus. Further evidence that the irregular shape of these curves is due to crystallization was obtained by repeating the tests on samples conditioned at a low temperature for a sufficient period to allow crystallization to

[13]Paper presented before Division of Rubber Chemistry, A. C. S. Detroit, Mich., Nov. 9, 1948, by W. E. Phillips and B. G. Labbe. For abstract see India RUBBER WORLD, Nov., 1948, p. 224.

TABLE 4. GEHMAN TEST DATA (TEMPERATURES, MINUS °C.)

Polymer No.	1	2	3	4	5	6	7	8	9	10	11	12
	Natural Rubber	GR-S (X-539)	122° F. PolyBD (XP-148)	14° F. PolyBD (XP-169)	Na PolyBD 81PC4-6	N 75/25 BD/S	Perbunan 26	85/15 BD/S (XP-138)	80/8/12 BD/I/S	GR-S (X-539)*	85/15 BD/S (XP-138)*	Perbunan 26*
Unconditioned Samples, May, 1950												
T_2	44	28	50	14	29	10	16	39	44	40	45	33
T_5	51	41	64	32	36	18	24	52	52	56	60	42
T_{10}	53	43	67	44	37	20	26	55	55	59	64	45
T_{100}	58	49	73	66	42	26	30	60	59	62	70	51
F. P.	58	49	73	67	42	26	31	61	59	64	71	52
Samples Conditioned for 94 Hours at —35° F., October, 1950												
T_2	43	33	51	20	26	11	17	41	46	45	45	35
T_5	50	42	62	29	35	18	25	51	51	55	58	43
T_{10}	51	44	65	35	37	21	26	53	53	57	63	45
T_{100}	56	49	71	58	42	26	30	60	58	61	68	51
F. P.	56	49	71	61	42	26	31	60	57	62	69	51

*Mixed in a special gasket recipe.

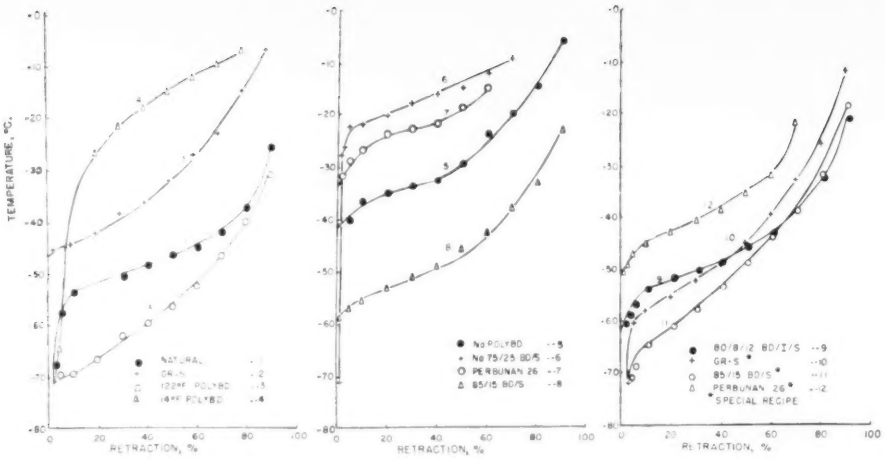


Fig. 1. Temperature-Retraction Curves—50% Elongation

become well established. Thus the results of the T-R test after 22 hours of conditioning of the samples at —35° F. showed a change in the shape of the curve, and the Gehman test conducted on samples conditioned for 94 hours at —35° F. also showed a change in the shape of the curve and an upward displacement of the freeze point by 6° C. Tests on the other polymers after similar conditioning produced results nearly identical with those obtained from unconditioned specimens. Natural rubber, however, which is known to crystallize, was not shown by these test procedures to be crystallizable.

The temperature-retraction data of U. S. Rubber, when analyzed in the manner prescribed by the company, indicated definite inferiority of the compounds made from natural rubber and 14° F. polybutadiene on the basis of the wide spread in temperature between the TR10 and TR70 values. It is interesting to note that the TR10 values (Table 3), except for that of the 14° F. polybutadiene compound, are in agreement with the Gehman freeze point values.

The Gehman procedure, as conducted by the Material Laboratory, differed slightly and utilized a modified instrument. Hence the results of these tests cannot be compared directly with the results from the other laboratories (Table 5). The lowest temperature investigated by the Material Laboratory in this test was —50° F. (—45.6° C.), which is considerably higher than the freeze point of the majority of the polymers examined. However it may be readily seen from the data for the sodium-catalyzed 75/25 butadiene/styrene and for the Perbunan 26 compounds that the moduli of these materials are far above the value of 10,000 lb. sq. in., which is generally accepted as representing the serviceability limit of elastomeric materials.

Direct comparisons of the Clash-Berg and Gehman low-temperature test methods were carried out by the Material Laboratory (Table 5).

TABLE 5. COMPARISON OF LOW-TEMPERATURE TESTS

(Torsional Moduli at —50° F.)

Polymer	Clash-Berg Method after 5 Seconds Psi.	Gehman Method after 10 Seconds Psi.
1 Natural rubber	4,700	1,400
2 GR-S	5,200	2,200
3 122° F. polyBD	2,700	890
4 14° F. polyBD	12,000	9,800
5 Na polyBD	11,000	4,000
6 Na 75/25 BD/S	460,000	320,000
7 Perbunan 26	340,000	230,000
8 85/15 BD/S	4,500	860
9 80/8/12 BD/I/S	3,100	1,000
10 GR-S*	2,400	650
11 85/15 BD/S*	2,500	730
12 Perbunan 26*	5,000	1,400

*Mixed in a special gasket recipe.

The calculations for the flexural moduli of the specimens were based on an analysis of the torsional deflection of rectangular cross-sectional members as presented by Trayer and March.[14]. If Poisson's ratio for elastomeric materials is assumed to be 0.5, the flex modulus of the several stocks on the basis of the torsional deflection of the specimens under known torque loads may be expressed by the equation:

$$E = \frac{3\ L\ T}{a b^3\ \mu\ \theta} \qquad (1)$$

where E = flex modulus.
L = specimen span length, in.
T = torque, in.-lb.
a = specimen width, in.
b = specimen thickness, in.
μ = a factor dependent on a/b.
θ = specimen deflection, radians.

In view of the constancy of L and r (with r = torque radius = 2.36 in.), and converting θ to ϕ (degrees), equation (1) may be expressed as:

$$E = \frac{1.33\ W}{a b^3\ \mu\ \phi} \qquad (2)$$

where W = total torque load, g.
a and b = specimen width and thickness, in.
ϕ = specimen deflection, deg.

The major portion of the differences in the absolute values of the flex moduli calculated from the Clash-Berg and from the Gehman data are attributed to the effect of friction in the pulleys and bearings of the Clash-Berg apparatus. While most of the work with the Clash-Berg instruments has been done by immersing only the test specimen into the liquid coolant, the experiments at the Materials Laboratory were conducted with the entire apparatus enclosed in a cold chamber. It is quite possible that friction in the bearings and pulleys was increased considerably over the friction when operated at room temperature.

The relative ratings of the polymers, as judged by the Clash-Berg and Gehman tests at —50° F. conducted by the Material Laboratory, and by the Gehman tests at —45° C., conducted by the Government Laboratories, are presented in Table 6. The ratings by Gehman freeze points, as determined by the Government Laboratories

[14]"Torsion of Members Having Sections Common in Aircraft Construction." NACA Report 334 (1929).

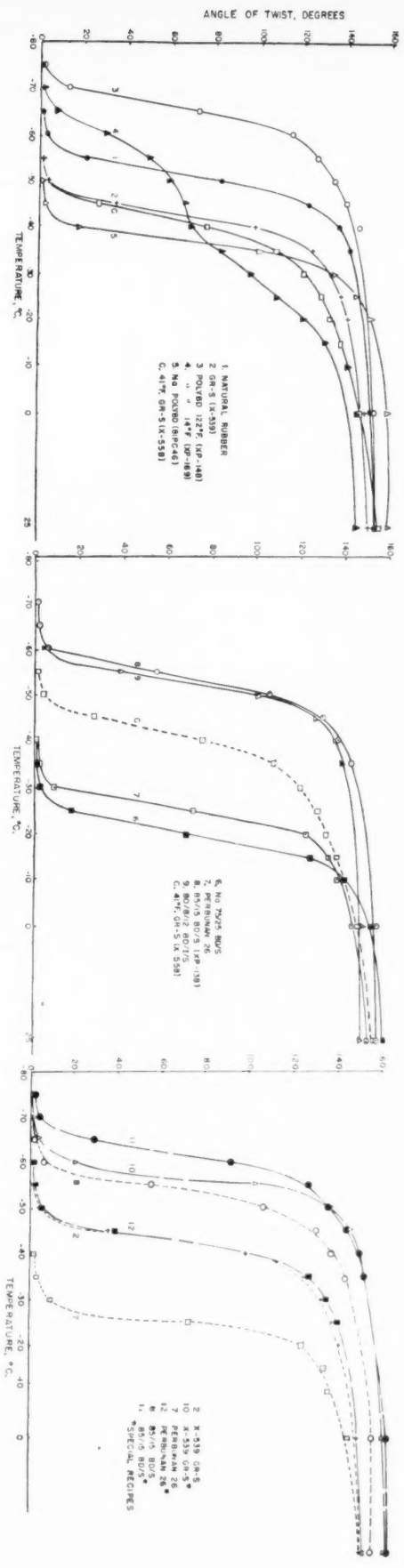


Fig. 2. Gehman Low-Temperature Curves

and Phillips, and by the TR10 and TR70 values determined by U. S. Rubber are included.

TABLE 6. RELATIVE RATING OF POLYMERS BY SEVERAL TEST METHODS

Key to Polymer Numbers

1. Natural rubber	5. Na polyBD	9. 80/8/12 BD/I/S
2. GR-S	6. Na 75/25 BD/S	10. GR-S*
3. 122° F. polyBD	7. Perbunan 26	11. 85/15 BD/S*
4. 14° F.	8. 85/15 BD/S	12. Perbunan 26*

Material Laboratory Clash-Berg at −50° F.	Material Laboratory Gehman at −50° F.	Government Laboratories Gehman at −45° C.	Government Laboratories Gehman Freeze Point	Phillips-Gehman Freeze Point	U. S. Rubber TR10	U. S. Rubber TR70
Relative Rating by Polymer Numbers†						
10	10	11	3	3	3	11
11	11	10	11	11	11	3
3	8	3	4	4	10	8
9	3	8	10	10	8	9
8	9	1	8	8	9	10
1	1	9	9	9	1-4	2
12	12	12	1	1	1-4	12
2	2	4	12	2	12	5
5	5	2	2	12	2	7
4	4	5	5	5	5	1, 4, 6
7	7	7	7	7	7	1, 4, 6
6	6	6	6	6	6	1, 4, 6

*Mixed in a special gasket recipe.
†The higher positions in the table represent the better stocks.

The Clash-Berg and Gehman tests at —50° F. rate the polymers in nearly the same relative order, except that the 85/15 BD/S sample (No. 8) is rated worse than 122° F. polyBD (No. 3) and 80/8/12 BD/I/S (N. 9) by the Clash-Berg test; whereas by the Gehman test it is definitely better than No. 9 and slightly better than No. 3. This lack of agreement between the two types of equipment may be due in this one instance to some fortuitous factor, such as an imperfect sample. Otherwise the data for the samples are consistent, and the agreement in the relative stiffness ratings between the two tests would be considered completely satisfactory, if the data for sample No. 8 were not included.

For all of the polymers, other than the readily crystallizable 41° F. polybutadiene, it is apparent that the Material Laboratory Gehman tests (at —50° F.) and the Government Laboratories Gehman tests (at —45° C.) produce the same relative ratings, except for transpositions involving only adjacent positions in the table. The freeze points did not afford relative ratings comparable with those supplied by the tests at a given temperature, but the freeze points probably are superior for establishing the true relations among the better low-temperature stocks.

(To be continued)

Plastics Industry Growing in Argentina

The plastics industry of Argentina owes its development largely to the absence of European suppliers during and immediately after the war. In 1945, about 30 companies were engaged in molding plastics; latest reports indicate that the number has increased to about 200. Originally celluloid and artificial horn from casein were the only products handled, but now thermoplastics, especially polystyrene, are being utilized in growing amounts, especially for mechanical goods for the automobile, electrical, and radio industries; household articles of polystyrene are also made. Tubing, packing, sheeting, and the like are made from PVC.

While the country produces casein in sufficient quantity to cover its needs for the production of artificial horn, raw materials for other plastics must be imported.

Recent announcements reveal plans for the expansion of polystyrene output to about 2,000 tons annually. Larger amounts of PVC are also to be produced, it seems, since the financial group, Orgasin, is reportedly about to erect a factory for producing solvents and plastics, chiefly PVC, on a site in the Lules River Valley in Tucuman Province. The company is said to have an initial capital of 10,000,000 Argentine pesos.

Editorials

The New Era of Natural vs. Synthetic Rubber Competition

WHEN the National Production Authority, on April 21, revoked its natural rubber specification controls, dropped all specific inventory limitations on natural rubber, GR-S, and butyl, and removed allocation controls on butyl rubber, it set the stage for the beginning of a new era of competition between natural and synthetic rubbers in the market place.

The price of natural rubber, because of reduced stockpile buying, has been dropping on world markets for some time, but it will not be until after July 1 that the rubber industry in this country will be able to benefit from the lower natural rubber price. The government will still continue to be the major source of natural rubber for manufacturers, in May at 48.5¢ a pound and in June at possibly 5¢ or 6¢ a pound less than in May.

Since the government feels quite certain that it will retain control of GR-S production and sale for at least one and probably two years, production of GR-S is being reorganized to take maximum advantage of low-cost petroleum butadiene, and, if necessary, the price of GR-S could be lowered to 20¢ a pound. With oil-extended GR-S, even lower prices might be possible.

Although the idea was recommended by the Administration and rejected by the House of Representatives in its vote on rubber legislation on March 24, there is still some hope that the production and sale of butyl rubber might be turned over to private industry, this year or next. This rubber, which the government sells now for 20.75¢ a pound, has recently shown promise as a tire as well as an inner tube rubber. Although the House voted to extend the Rubber Act of 1948 for another two years without prior public hearings, the Senate Armed Services Committee has agreed to such hearings on the requests of some rubber goods manufacturers and members of the Senate. As a result, a one- instead of a two-year extension of the Rubber Act together with a fairly prompt disposal of butyl rubber plants to private industry might still be realized.

In any event, as pointed out by W. J. Sears, vice president of The Rubber Manufacturers Association, at the time of the April 21 relaxation of NPA rubber controls:

"From now on, natural rubber will find American-made synthetic rubber a stiff competitor. Synthetic rubber accounts for 65% of our current consumption in the United States, and all rubber products are of satisfactory quality. Quality of both the raw material and end-products is vastly improved. The cleanliness, uniformity, and packaging are vastly superior to natural rubber and are factors which make it particularly attractive to the manufacturer.

"The future success of natural rubber as a competitor rests on the ability of producers to develop a clean, uniform product, properly graded and packaged. Improvements in that direction are long overdue."

Natural rubber producers have generally recognized that their success in holding or expanding the use of their rubber in the American market would be dependent on an improved product. "Technically classified" rubber, which is rubber of known and more uniform curing characteristics while still identified by the commercial RMA grading system, was produced to the extent of nearly 20,000 tons in 1951. Available at no increase in price, T. C. rubber has been obtainable, however, only in the #1 Ribbed Smoked Sheet grade to date, but is expected to be sold in lower RSS grades in 1952.

If the natural rubber producers can provide significant tonnages of T. C. rubber in the lower RSS grades, with improved cleanliness and packaging, and at a price competitive with American synthetic rubber, they should be able to retain a market for 700,000 long tons a year in this country. The price of natural rubber in the United States in the foreseeable future, however, will have to be stable at 30¢ a pound or less. Such a price may be adequate to provide a good profit to producers in Malaya, but it is understood that it is very close to the "break-even" point for producers in Indonesia.

There has been much speculation on the price of GR-S, when and if its production and sale become a private industry operation. Obviously capital acquisition, sales and advertising expense, and taxes are not a significant part of the cost of government operation. Raw material costs to the government are also less than they would be to private industry. Competition among the various future private producers and continued research and development could be depended upon, however, to keep the spread between the present government GR-S price and the future private industry price to a minimum.

One way to get a preview of how all synthetic rubber will fare in real competition with natural rubber would be to turn butyl rubber production and sale over to private industry immediately. It is generally agreed that there is no logical reason for continued government control of butyl rubber. The production and sale of neoprene has been in private industry hands since 1949, and the quality and availability of new types have been improved while the price has remained reasonable.

A new era of natural *versus* synthetic rubber competition seems finally about to begin. The future for the rubber and associated industries, in this connection, looks bright.

R. G. Seaman

DEPARTMENT OF
PLASTICS TECHNOLOGY

Extrusion of Cellulose Acetate and Cellulose Acetate Butyrate[1]

E. C. Blackard[2]

SINCE the title of this talk is rather general, I would like to define the subject more definitely. First I would like to shorten the names cellulose acetate to Tenite I[3] and cellulose acetate butyrate to Tenite II[3] for the sake of convenience. Both Tenite I and Tenite II are furnished in pellet form for extrusion into sheets, rods, tubes and various other shapes. The method discussed in this paper does not involve the use of solvents. Furthermore I will describe only those features considered of unusual value to the extrusion of a better-quality product and not cover the entire subject of extrusion in complete detail.

The extrusion of Tenite I and Tenite II has been carried on experimentally at Tennessee Eastman for approximately 15 years. For at least 10 years an applications laboratory has been maintained with the objective of developing the best possible technique. This information is passed on to customers by means of demonstrations, drawings, and reports.

From this experimental work over the past years certain basic principles have been established about extrusion of cellulose acetate and cellulose acetate butyrate. Despite the amount of work done, much is yet to be discovered in extrusion work, and you may rightly conclude that some principles discussed in this paper could be explored much further.

A great percentage of our work has been limited to the extrusion of sheeting in gages from 0.001- to 0.060-inch; the extrusion of pipe from 2.0 to 4.5 inches in O. D.; and the extrusion of shell-variegated strip. The extrusion of small tubing and varied shapes of strips and rods has become well known in the trade, and the laboratory has not much work on these extrusions. It has been our aim, of course, to carry out work which would broaden the extrusion field and make this information available to interested customers.

Use of Hopper

For good extrusion the need of a thoroughly dried feed cannot be emphasized too greatly. The hopper dryer shown in Figure 1 has been developed to insure this condition. Air is supplied into a hollow annular space at the bottom of the hopper and passed from this space through a perforated plate into the plastic pellets. This air is heated to a temperature of 150-170° F., depending on the hardness of the material, and it percolates up through the pellets to escape at the top of the hopper. The capacity of the hopper should be 50% greater than the rated capacity of the extruder in pounds per hour so that the pellets will be exposed to the hot drying air at least one hour.

If continuous feed to this hopper is impractical, it should be kept replenished at a rate to insure that the feed is exposed to hot air for one hour. As an example, on a 3½-inch Royle extruder with a 36-inch screw the capacity of the hopper is 150 pounds so that we can safely allow 50 pounds to feed into the machine before refilling. It has been found that 80 c.f.m. of free air at standard conditions are required to obtain thorough drying.

The hopper is designed to use compressed air drawn from an 80 psi. supply, passed through a water separator to entrap moisture, and then passed through an open-coil electrical heater. The heater we have used is of 12-kilowatt capacity and has been found adequate for heating air required for extrusion rates of 100 pounds per hour. From the heater the air is controlled manually through a valve to the hopper. To force the air through the pellets about five to eight inches of water pressure are required.

If a plant does not have compressed air available, it is practical to use blown air which has been drawn through a filter and fin heater. This method of heating and supplying air has been used and is quite satisfactory, though the use of compressed air does give easier control of the flow and the temperature.

You will notice that the perforated plate is removable for easy cleaning. To prevent the pellets from channeling down the center, a baffle plate is placed in the bottom of the hopper to spread the pellets to the outer circumference of the perforated plate.

What are the advantages of the hopper dryer over a tray dryer or a continuous belt dryer? First, with a hopper dryer the heated air surrounds each pellet to give uniform drying. Use of a hopper dryer also eliminates the characteristic often evident in a tray dryer of the top layer of pellets being melted enough to stick together while the bottom layer does not dry completely. This condition, of course, could occur with a hopper dryer if the temperature were not properly controlled, but normally it is not a problem. In very humid conditions dried material in an unheated hopper of an extrusion machine may pick up some moisture while feeding into the machine. Still another advantage is that the hopper is entirely closed to minimize any contamination from outside sources.

It has also been observed that batches of pellets being supplied to the extruder hopper from a tray dryer will vary in temperature enough to cause non-uniform flow in the extruder. The uniformly heated material in a hopper dryer will give a more uniform temperature condition at the feed section of the extruder. For these reasons and from our successful experience using a hopper dryer, it can be recommended as a proven piece of equipment.

Extrusion of Sheeting

More work has been done in our laboratory on the extrusion of sheeting than on any other type of extrusion. One of the most important points to be emphasized in sheet extrusion is exact control of temperatures in the extruder and the die. There are three sections in the extruder: (1) the feed section, cooled by water at room temperature; (2) the preheating section; and (3) the melting section. The preheating and melting sections are heated by one source of circulating hot oil. This oil heater is operated at a definite temperature, and the temperatures of the preheating and the melting sections are controlled by throttling the flow of oil into them.

As an example, when 205-H2 Tenite II, a common material for the extrusion of sheeting, is being run, the temperature of the preheating section might be 385° F., and the melting section 400° F. The temperature of the oil supply in this case would be maintained at 400° F. Most of our work has been done using a circulating hot oil system so that I cannot make a comparison between hot oil heating and electrical heaters. A point to consider, however, is that hot circulating oil extracts heat if frictional heat becomes great enough to cause the extruder to overheat; whereas direct electrical heaters would not serve such a purpose. In extruding cellulose acetate or acetate butyrate, frictional heat from the extruder screw is a factor.

This discussion is too basic to dwell on at length since temperature control is a common necessity in all thermoplastic work. I would like to point out, however, that wherever heat is applied, a thermocouple is attached to the heated piece to control the temperature. A band heater is used on the gate to which the die is attached, and this heater is controlled by a thermocouple connected to a regulator. No heat is applied to the screw at all. For heating the die we have used both electric

[1]Based on a paper presented at national technical conference, Society of Plastics Engineers, Inc., Chicago, Ill., Jan. 16, 1952, and originally published in *SPE Journal*, Mar., 1952, p. 8.

[2]Superintendent, Tenite applications department, Tennessee Eastman Corp., Kingsport, Tenn.

[3]Trade mark of Tennessee Eastman Corp.

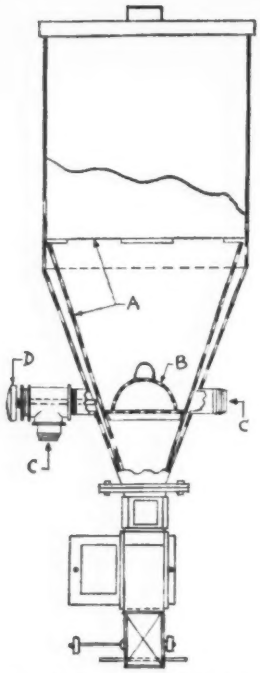


Fig. 1. Drawing of Drying Hopper for Tenite Extrusion Showing: (a) Removable, Perforated Plate; (b) Baffle; (c) Air Inlet; (d) Thermometer

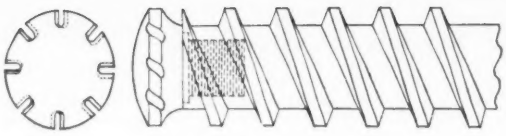


Fig. 2. Drawing of Throttling Tip on 3¼-Inch Extruder Screw

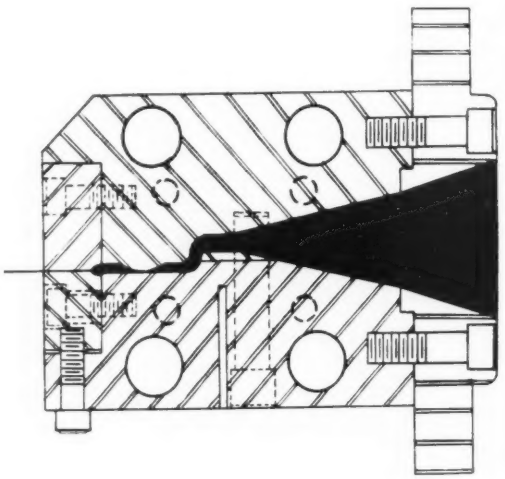


Fig. 3. Diagram of 28-Inch Wide Flat Extrusion Die for Tenite Sheeting, Showing Section through Center of Die

strip and inserted heaters with equal success.

The bottom edge of the extruder die is cut at an angle to allow the die to come within three inches of the pullout rolls. The temperature of these rolls is controlled by a hot-water circulating system so that heat can be added or extracted to maintain a constant temperature. The temperature is maintained as high as possible to prevent condensation of plasticizer and yet not have the sheet stick to the roll. These pullout rolls are chrome plated and highly polished, and the smooth surface of the rolls is imparted to the sheet to some degree. This arrangement has noticeably improved the surface finish of extruded sheeting.

Prevention of Surging

Everyone who has worked with extruders has experienced trouble with surging or uneven flow of material from the extruder. The surging is due to a great extent to uneven flow from the screw. A rather simple alteration which has greatly improved the flow of material to the die of the extruder is the throttling tip for a 3¼-inch extruder screw, shown in Figure 2. This removable tip is fastened to the end of a standard screw by drilling and tapping the end of the screw to receive the tip. The material feeding from the flights of the screw must pass through the slots of the tip, thus breaking up the rope of plastic obtained from the screw flights. In this manner the material is cut and worked so that a more uniformly heated mass is delivered to the die. Just forward of the tip the usual screen and backing grid are placed.

From my experience this simple device maintains a back pressure on the screw to dampen out uneven delivery of material and apparently prevents any cold plastic mass from depositing on the screen and partially plugging it until it is heated sufficiently to pass on through. This tip has been a greater help than any changes in the screw yet tried in an effort to obtain uniform flow. The alteration, of course, is one which can be made to existing screws and for that reason can be tried with little expense.

It can be said that this desirable effect caused by the screw tip alteration might be gained by a screw whose flights are so designed as to give a uniform flow. It is my opinion that much could be accomplished in a complete study of screw design to give the proper compression ratio to cause a more uniform flow of material. Some work on this subject has been done, but not enough to give conclusive results. It can also be said that variation in the tip design might give improved results. At least this work would be much less expensive to carry on, and it would also be easier to alter present equipment.

The tip shown in Figure 2 which has given such good results restricts the plastic flow by approximately 30%. The improved results were observed when sheeting 0.040-0.060 inch thick was being extruded. Formerly without the tip it was not possible to extrude this sheeting without ripples forming in the center of the sheet. With the screw tip hardly any trace of ripples could be observed, indicating that they had been caused by non-uniform delivery of material from the screw.

Sheeting Die Design

For a number of years all the experimental work in the extrusion of sheeting was done with round dies. The round die does give a more uniform flow of material from the orifice than the flat die since the hot material has an equal distance to flow from the extruder cylinder to the orifice. Furthermore, since the material is uniformly spread over a torpedo, it is heated evenly. Yet with these advantages, the real difficulty lies in handling the sheet from a round tube, slitting it at one point, and drawing it across spreaders to flatten it.

Whereas extrusion equipment using a flat die has the pullout rolls mounted as close as possible to the die, with no cooling rings needed, extruding sheet from a round die requires a maze of cooling rings, spreaders, etc., in order to get the sheet slit and spread flat without damaging its surface and causing strains to be set up by deforming it in a semi-cooled state. In addition, sheeting thinner than 0.0075-inch cannot be extruded satisfactorily from a round die. A flat die, on the other hand, generally requires no cooling air. The sheet is cooled to approximately 200° F. by contact with the pullout rolls and after leaving them can be slit and wound up without any difficulty.

With Tenite I extrusions some difficulty is caused by plasticizer fumes concentrating underneath the sheet between the die and the pullout rolls. The fumes sometimes cause a slight etching of the sheet. To prevent this condition a slight amount of air has been used to carry these fumes away, but this set-up is not entirely successful because it causes a slight movement of the sheet.

Another solution not yet proved entirely is to draw these fumes away through a suction box. I do not mean to leave the impression that all sheet extrusion is unsuccessful owing to this trouble, but on some formulations and thicknesses it is a problem. With larger machines running at higher rates it would be a greater problem, and for that reason it has been mentioned together with a suggested solution.

From our experience, despite the advantages in uniform flow of a round die, an extruded sheet of better quality can be made with a flat die. A section of the flat die (28 inches wide) which has given the best results is shown in Figure 3. Heating of the die is accomplished by means of inserted electrical heaters that are half as long as the die is wide. Eight heaters are used; four inserted from one end of the die, and four from the other. It is felt that these heaters, as they are positioned, do offer the advantage of permitting adjustment of the temperature of the die. It has been found advantageous to maintain a slight temperature differential between the front set of heaters and the set nearer the extruder. For example, in extruding a 205-H2 Tenite II material the front set of heaters is maintained at 385° F. and the back set at 400° F.

The greatest difficulty with a flat die is to get uniform distribution of the hot material across the entire width of the die. There is a great tendency for material to flow directly through the center of the die, causing a thick section in the center of the sheet and also causing heavier-gage sheeting to have ripples in the center. To overcome this trouble a restriction is maintained just behind the die lips. This restriction causes the hot material to flow laterally across the width of the die before flowing on into the lips. The restriction also maintains a back pressure on the material to cause the voids and bubbles to be ironed out before the material flows to the die lip. This restriction, together with the screw tip previously described, has made possible the extrusion of sheet free of ripples or "clouds." A "cloud" may be defined as an apparent thick or thin section which can be easily recognized as light or dark wavy shadows in a colored translucent sheet.

This idea of restricting the flow of ma-

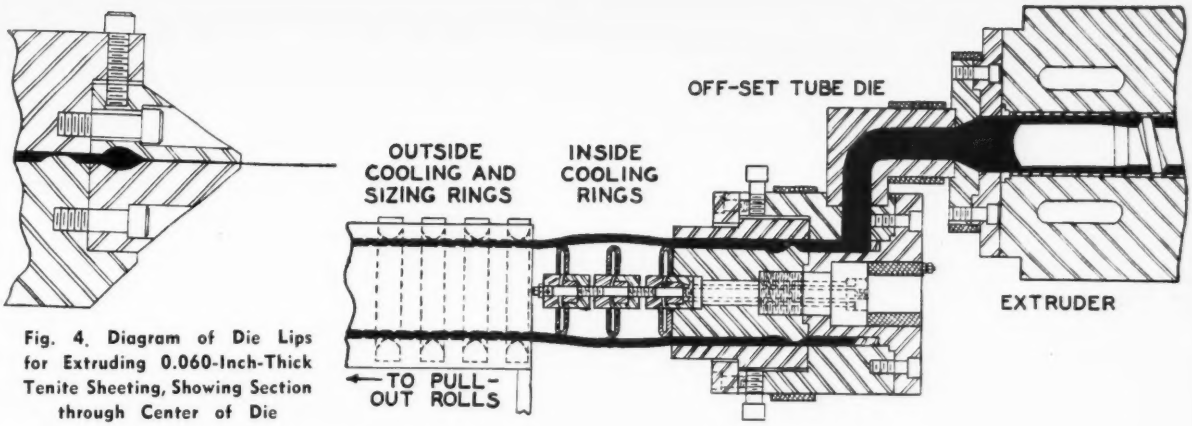


Fig. 4. Diagram of Die Lips for Extruding 0.060-Inch-Thick Tenite Sheeting, Showing Section through Center of Die

Fig. 5. Diagram of Equipment for Extruding Four-Inch-Diameter Tenite Pipe

terial before the die lip is another point to be emphasized, especially in the extrusion of thicker sheeting. The need of using the idea has been further established in the extrusion of a heavier wall pipe.

It should be pointed out that one of the basic aims in extrusion is to deliver a uniformly heated mass to the die and keep it uniformly heated until it issues from the die lip. For that reason thick sections are to be avoided. The offset section preceding the restriction, where the material flows laterally in the die, is kept comparatively thin and yet does act as a reservoir of material constantly to maintain a pressure on the die lip. The change in flow characteristics with slight variations in temperature, coupled with the poor thermal conductivity properties of the material, presents real problems in maintaining a uniformly heated mass in the die.

The material has a great tendency to stick and become overheated on the hot metal, while the center portion becomes non-uniformly heated when in thick sections. With the flat die, as shown in Figure 3, sheeting from 0.001- to 0.040-inch thick has been extruded.

The extrusion of very thin sheeting, 0.001-inch thick, is not truly the same process as the thicker sheeting. It is done by drafting the sheet from a flat die while sacrificing width. From a 28-inch wide die lip having an opening of 0.006-inch, 0.001-inch thick sheeting is drafted to a 22-inch width at rates of 50-75 feet a minute. Quality of this sheeting is surprisingly good, but difficulty is experienced in slitting and winding this sheeting without wrinkling. Careful alinement of all rolls and a very slight tension on the wind-up will permit winding in smooth rolls. While this sheet is not of a quality equal to solvent roll coated sheeting, it is suitable for many wrapping applications and can be used as thin film for laminating work.

To extrude 0.040-0.060-inch thick sheet the die lips were changed, as shown in Figure 4. Above 0.040-inch gage the die lips shown in Figure 3 did not offer enough resistance to the flow of material to give a uniform sheet. Then, too, with the protruding lip of Figure 4 the sheet is delivered nearer the pullout surface to prevent any thinning of the sheet due to its drawing from its own weight. In effect the die lips for thick sheeting increase the land length to offer greater resistance to flow and obtain a uniform thickness even in the 0.060-inch sheet.

There is a general guide for the design of die lips. In general, thicker sheeting requires longer lands; whereas thin sheeting requires shorter lands. For extruding sheeting in a number of thicknesses the land length and orifice opening should be approximately as shown in Table 1.

TABLE 1. DIE LAND LENGTHS AND ORIFICE OPENINGS FOR VARIOUS SHEET GAGES

Sheet Thickness, In.	Orifice Opening, In.	Land Length, In.
0.01	0.010	$\frac{3}{8}$
0.02	0.022	$\frac{5}{8}$
0.03	0.034	$\frac{3}{4}$
0.04	0.045	$1\frac{1}{4}$
0.06	0.045	$2\frac{1}{2}$

While this rule of orifice design is generally true, it cannot be overlooked that with a flat die not nearly so much drafting is done on sheeting from 0.020-0.060-inch thick as is done when a round die is used. It is often true, therefore, that the orifice opening can be 0.040-inch to extrude a sheet more than 0.040-inch thick. In extruding 0.060-inch thick sheet, it was found necessary to use a long land and a 0.045-inch orifice to obtain the best results. The sheet was not drafted, and the back pressure was built up by the wide land to cause the sheet to issue from the orifice and thicken. This extrusion, of course, was done using a flat die. When the orifice was set as normally recommended (about 0.060-0.065-inch), the back pressure was not sufficient to prevent surging. I might add that had the heating capacity of our extruder been greater to allow a higher rate of extrusion in feet per minute, the conditions on 0.060-gage sheet might well have been normal.

Quality of Sheeting

From the quality aspect, extruded sheet is not so good in thickness uniformity or in freedom from imperfections as sheet made by the solvent roll coating process. It can be extruded, however, into an attractive, sufficiently uniform product for many sheeting applications. It is my actual experience that 0.001-inch thick sheet can be made with a gage variation of not more than 0.00025-inch crosswise or lengthwise. On medium thickness sheeting of 0.020-inch it is possible to run with not more than 0.002-inch variation, and on 0.040- to 0.060-inch thick sheet, with not more than 0.003-inch variation. These figures are conservative and well within reach of an extrusion process which is properly designed and operated.

Extrusion of Pipe

Within the last two years a need has arisen to extrude Tenite pipe in outside diameter sizes of four inches and smaller. The same requirements for drying the material and controlling temperatures apply to the extrusion of pipe as to the extrusion of sheeting. The same type of hopper dryer is used, and circulating oil is the heating medium on the extruder. Electrical band, strip, or insertion-type heaters are used on the die. Extruder screws of either the torpedo tip or slotted tip (see Figure 2) designs may be used.

The method of handling the extruded pipe after it issues from the die is of interest. When the process was first considered, various schemes were proposed for cooling the extruded pipe to keep it round until it was self-supporting. A mandrel could have been used over which the pipe would have been extruded and cooled with water or air. The pipe might have been extruded directly into water and chilled quickly into shape.

It was found that the rather simple process shown in Figure 5 gave an easier solution and a tougher pipe. The pipe is first cooled only slightly and held in shape by the three inside cooling rings. Air heated to 180° F. and at a pressure of 20 psi. is supplied by a pipe running through the center of the inside die ring to the three inside cooling rings. This heated air is also supplied to the first outside cooling ring. The three other outside rings are supplied with compressed air at room temperature.

By this method of cooling, the heavy section is not chilled to set up strains and cause brittleness, as might be the case with other methods of cooling. The pipe is supported by the hot compressed air supplied to the inner rings. These rings are made by fastening together two plates spaced in such a manner as to leave an orifice for air to escape over their entire circumference. Two sets of spring-loaded pullout rolls draw the pipe at a uniform rate through the outside cooling rings.

With the internal air pressure forcing the pipe to fill the outside cooling rings, a uniform outside diameter is maintained in the pipe. You will notice that the pipe is shown to be slightly swollen prior to entering the first outside sizing ring. This is actually the very thing that takes place in the extrusion process. While it may appear that trouble would be encountered in drawing the swelled pipe through the first ring, such is not the case. The pipe is soft enough to be slightly drafted and sized.

Pipe Die Design Features

The pipe die shown in Figure 5 is offset for a purpose. First the inside die rings can be held in place by the center stud which fits in from the back of the die. The outer ring is held by an outer clamping ring. This design allows rings of a

wider range of diameters to be used than would be possible when a die is used fastened directly to the extruder and requiring the die rings to be bolted on from the front face of the die.

The offset die also permits the introduction of heated air to the inner cooling rings without running the air pipe through the path of the plastic material. Incidentally, this pipe is insulated from the die body to prevent the inside of the die from being chilled. This point should not be overlooked in the design.

With this design the same die body can be used to extrude pipe diameters from two to six inches. With a second die body, pipe can be extruded in diameters from ½-inch to two inches. Thus two die bodies are sufficient to cover a range of pipe from ½-6 inches in diameter. It is interesting also to note that material flows around the die to give only one weld point.

Another unique feature is the restriction in the die similar to that of the sheeting die previously discussed. It was on this extrusion of a ¼-inch wall pipe that the idea of restriction in dies was discovered. Without such a restriction the pipe wall was filled with bubbles and voids. By use of the restriction these bubbles were forced out of the material to give a solid, uniform pipe wall. The long land length also bears out the general conclusion expressed in the extrusion of sheeting that the land must be lengthened as the thickness of the material extruded is increased.

Advantages of Pipe Extrusion

Many questions may arise as to the merits of this extrusion process as compared to other methods. One such question might be the cost of using such quantities of compressed air. The extrusion process does require 100 cubic feet per minute of free air to cool a four-inch I. D. by 4.5-inch O. D. pipe. This would require the purchase of a $2,000 compressor, but the cost per pound of extruded pipe to operate the installed unit would be not over a quarter of a cent. This element of cost is believed to be offset by the simplicity of the operation and the assurance of obtaining a pipe relatively free of strains. I have seen very brittle pipe granulated and reextruded to be very tough; the improvement came from nothing more than the technique of extrusion without strains being set up.

The process as shown, however, is not a cure-all for strain-free pipe. It should be recognized that even with heated air to cause gradual cooling care must be used to avoid strains. The least amount of air possible to support the pipe and control its dimensions should be used. It is surprising how small details can give such great differences in the quality of an extruded product. These procedures are sometimes hidden by operators who learn them through experience; so it is well to keep a good record of the exact methods by which satisfactory results are obtained.

The question is sometimes asked, "What are the tolerances possible in this process?"

While this problem has seldom arisen on installations replacing metal pipe, I do know of one case where a four-inch pipe was cut into sleeves to fit over a shaft. The ±0.015-inch tolerance on this job was met without difficulty. A variation of not more than 0.030-inch in any direction can be maintained in four-inch diameter pipe. Of course in smaller sizes much less variation would be possible.

TABLE 2. BURSTING PRESSURES OF EXTRUDED PIPE
(Tenite II, Formulation 205E-MH)

Pipe Size, In.	Outside Diam., In.	Inside Diam., In.	Wall Thickness, In.	Bursting Pressure, Psi.		Recommended Working Pressure, Psi.	
				At 77° F.	At 158° F.	At 77° F.	At 158° F.
½	0.840	0.622	0.109	1500	1000	150	100
¾	1.050	0.824	0.113	1300	800	130	80
1	1.315	1.049	0.133	1250	750	125	75
1¼	1.660	1.380	0.140	1050	625	105	62
1½	1.900	1.610	0.145	950	550	95	55
2	2.375	2.067	0.154	825	500	82	50
2½	2.875	2.469	0.203	875	525	87	52
3	3.500	3.068	0.216	800	450	80	45
3½	4.000	3.548	0.226	725	425	72	42
4	4.500	4.026	0.237	675	400	67	40

Bursting Pressures of Extruded Pipe

Aside from the extrusion problem, the bursting pressures of Tenite pipe are of interest. The 205E-MH flow formulation is generally recommended for use in pipe. This material is Tenite II and contains an ultra-violet light inhibitor to increase its resistance to light and outdoor exposure. The bursting pressures for pipe extruded from this formulation are given in Table 2.

It will be noticed that a 10:1 safety factor is recommended between bursting pressures and working pressures. This factor should be very conservative to cover all conditions, but could be less in many applications. When Tenite pipe is considered for an application, it is wise to test samples to observe performance until more experience is gained. This can be the only sure way of determining the applications for which it is best suited. The test data, however, can be used as a guide to judge whether the application is at all practical.

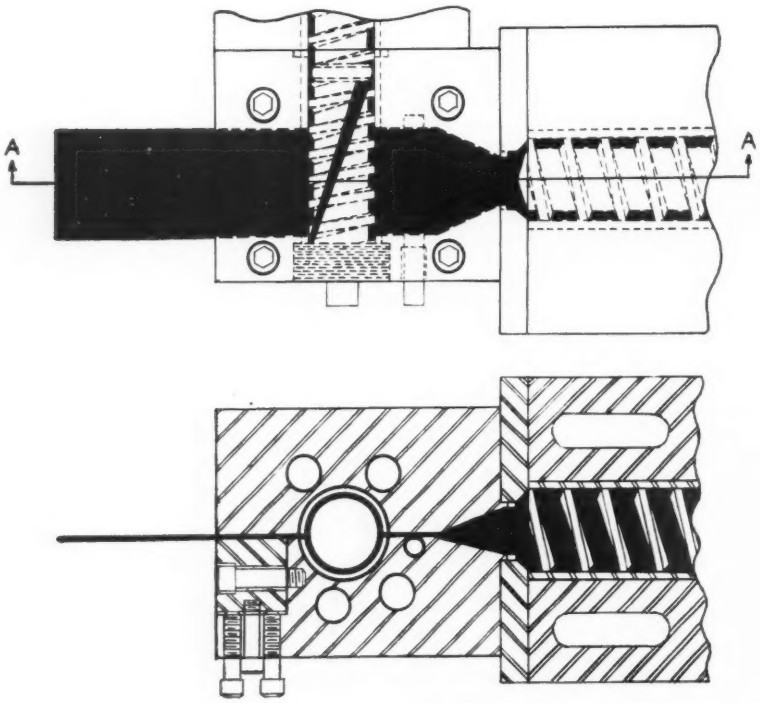


Fig. 6. Diagrams of Equipment for Extruding Variegated Tenite Strip Showing *(Above)* Plan View and *(Below)* Section through A-A

Extrusion of Variegated Strip

At the risk of covering too much ground in a rather brief manner I now would like to describe the extrusion of a variegated strip. For this extrusion we have used two extruders feeding material into one die (see Figure 6). One is a 2½-inch diameter National Rubber Machinery Co. extruder used to feed a light base material; while the other is a two-inch extruder used to feed a darker filler. The objective, of course, in this process is to produce a variegated pattern comparable to the shell variegations commonly used for spectacle frames.

With the use of the two extruders a variegated strip was produced, but the filler was smeared in regular, diagonal stripes across the width of the strip. Also another difficulty was encountered in that the filler made a black edge on the strip as it fed across from the small extruder into the stream of base.

The black stripe was eliminated by putting a liner in the die so that the filler would be carried past the edge of the stream of base material before it extruded from a slot in the liner. The filler then could not blacken the edge of the finished strip, but was smeared into the base material.

To give a broken pattern of splotches of filler in the base the screw in the filler extruder was cut off, and a special tip four inches long was attached. The flights on this tip were slotted so that small splotches of filler were delivered into the stream of base material to create a broken

pattern. A number of tips were used with the flights slotted in various ways to produce varied effects. The use of tips was only done to avoid producing new screws for each trial.

The pattern can be changed by using harder or softer fillers, using different colors for the base and filler, and by changes in the speed of the screws of either machine. Changes in the ratios of the two screw speeds will also change the variegation. All of these variations, however, only change the concentration of filler in the base or the number of splotches per inch. To change the orientation of the splotches in the base the flights of the screw tip must be altered.

There is little to explain from an extrusion standpoint about the production of this variegated strip. It is certainly unique to have a process that will continuously produce a variegated strip of uniform pattern which is reproducible from one run to the next. With this idea in mind it is possible by altered die designs to extrude variegated rods. Since much of the variegated sheet material made in the past has been produced by batch pressing, this development is of interest as a possible method of producing variegated sheet stock or rods at considerably less expense. By using this general design with alterations in the die, it is possible to produce strips or rods of two or more solid colors not smeared into each other. Nothing but variegated strips have actually been produced, however, but these suggestions are mentioned as being well within the realm of possibility.

Future Development Work

Future plans for work on the extrusion of cellulose acetate and acetate butyrate may be of interest. The applications laboratory of Tennessee Eastman will continue, as in the past, to be guided by the interests of customers in its particular extrusion problems. No one can predict what path this may take. Certainly we will have time to continue to study improved methods of extrusion for sheeting and pipe.

One subject which I have not mentioned may well be a part of the program, and that is to calender a sheet to improve its surface or produce a mat finish. To date much work has been done on this problem, but without success. The most encouraging results, however, have been obtained by calendering the hot sheet as close to the die orifice as possible before it has cooled. Certainly, to obtain a surface as good as a cast or roll coated sheet, some method must be found to impart continuously the surface of a roll to the extruded sheet.

Work is being done at present on a process to reinforce extruded pipe to enable it to withstand greater bursting pressures and thereby broaden its field of application. The present work is being done using a Fiberglas filament wrap.

Summary and Conclusions

The technique of extrusion of cellulose acetate and cellulose acetate butyrate is very practical as an industrial process. Many improvements will surely appear, and we plan to continue our work to that end.

I have tried to present the general problems as we recognize them in extruding the best-quality sheeting or pipe from cellulose acetate or cellulose acetate butyrate. It must be admitted that the process of extrusion must to some extent be classed as an art. All the factors, particularly those affecting flow, cannot be entirely explained. This is probably true about much of plastics processing.

To summarize, it is extremely vital to dry the material and to control temperatures at all points in the extrusion. Then, as the final requirement, the material must be delivered to the die both uniformly heated and at an even rate. Of great importance is the obtaining of proper back pressures by means of restrictions such as the screw tip, the screen, and grid plate; the restriction prior to the die lip; and the proper land length on the die lip.

Since the general method of mechanical and hydraulic extrusion has been practiced for many years, none of the apparatus or methods described in this paper should be employed without prior investigation of the patent situation.

SPE Section Meetings

THE New York Section of the Society of Plastics Engineers held its April meeting on the sixteenth at the Gotham Hotel, in New York, N. Y. Speaker for the evening was Louis Lee Buhler, Buhler Service Corp., who discussed "Accidents in the Plastics Industry—Their Prevention and Cost."

At a short business session preceding Mr. Buhler's talk, Bruno Wessinger, Wess Plastic Molds, Inc., president of the Section, reported a communication from the Newark SPE Section inviting New York Section members and their wives to a dinner-dance to be held at the Essex House, Newark, N. J., May 23. Harold Schwartz, Empire Brushes, Inc., spoke in connection with the availability of students of the Chelsea Vocational High School, New York, for cooperative work with the plastics industry in the New York area. Information on this project may be obtained either from William Cox, teacher-in-charge, or P. Dahlgren, placement counselor, Chelsea Vocational High School, 16 Clarkson St., New York 14, N. Y. The telephone number is WAtkins 4-8948. In addition, a request for equipment and supplies to improve the small plastics fabricating shop at the school was mentioned by Mr. Schwartz.

Mr. Buhler first explained that his organization specialized in workmen's compensation insurance and the interpretation and servicing of such insurance. His activities are limited, however, to five industries, including plastics. The plastics industry, for accident and safety rating, is divided into four divisions as follows: (1) injection molding; (2) compression molding; (3) extrusion and custom molding; (4) fabricating. Rates for workmen's compensation insurance have recently been reclassified to somewhat lower figures, and the existing rate for the molding branches was given as 3%, for the extruding branch as 2.2%, and for the fabricating branch as 4.04%.

Mr. Buhler then discussed the problems involved in the employment of minors, the employment of workers with medical disability, and the so-called "second injury law." An active question-and-answer period followed the talk.

Table favors were distributed through the courtesy of American Improved Products Co., and the meeting was concluded with the drawing for door prizes contributed by E. I. du Pont de Nemours & Co., Inc.; Dr. Barail, consultant; and Chelsea Vocational High School.

Plasticizing Thermoplastics

The March 5 meeting of the Western New England Section, SPE, held in the Sheraton Hotel, Springfield, Mass., was in the form of a symposium entitled, "Plasticizing of Thermoplastics for Injection Molding." Panel members were Sanford Glick, Monsanto Chemical Co.; Sherwood Young, Church Mfg. Co.; and George Whitehead, Improved Paper Machinery Corp.

Mr. Whitehead reviewed the development of preplasticizing machinery. The function of the preplasticizer unit is to preheat or premelt the plastic; after which operation it can be conveyed to the injector cylinder by plunger or screw. The capacity of a preplaticizer depends on its melt capacity; and the mechanical features of several makes of machines were described. Polystyrene, polyethylene, and methyl methacrylate were all considered as especially adaptable to preplasticizing.

The requirements of a good preplasticizer were given as: heating capacity, heat and pressure control, delivery at proper rate during injection dwell, and delivery under pressure (maximum 15,000 psi.). The molding of heavy sections is benefited most by preplasticizing, it was said.

Mr. Glick concurred that without preplasticizers the molding of large parts would be extremely difficult, if not impossible. The first preplasticizers were offered in 1947; there are now probably 35 to 45 types of preplasticizers in sizes from four to 300 ounces. Examples of products now being molded with the use of preplasticizers are 10-pound battery cases and refrigerator inner doors. White materials can be preplasticized, and better results with dry colors are obtained when the preplasticizer is used. In addition, lower clamping pressures for the injection mold and better dimensional stability with less strain in the finished pieces, made with faster mold cycles, are other advantages. Disadvantages were cited as more difficult surging, more difficult starting, and difficulty in molding mottled surfaces.

Mr. Young gave the molder's view of preplasticizing units. Church Mfg. started making its own preplasticizing and injection units in 1949. The Church machine does not use any valving on the material. The preplasticizing cylinder is run very hot, and the injection cylinder is run at holding temperature. The nozzle is made with four small holes instead of one large hole. The preplasticizing cylinder, mounted at an angle of 45 degrees, feeds in one shot rather than by pumping. Some difficulty in starting up is experienced after a cycle delay, and special sprue pullers are used. The speaker said he felt that parts as large as 600 ounces could be molded, but would probably be too fragile for most practical uses.

A question-and-answer period followed the talks, and the principal item of discussion was the relative clamping pressures required with preplasticizing units and conventional injection cylinders. It was pointed out that when a machine is used only at part capacity, less pressure is needed.

Extruded Vinyl Film

The Western New England Section at its meeting on April 2, also at the Sheraton, devoted its program to "Extruded Vinyl Film." Speakers were Albert Stover, Naugatuck Chemical Division, United States Rubber Co.; and Ralph Hansen, Monsanto.

Mr. Stover discussed blow extrusion of vinyl film on a 1½-inch extruder with the help of slides and films. Until recently, the extrusion of vinyl film was considered almost impossible, but the advent of new and better vinyl resins, films as thin as 1/10-mil and of almost any width, can be made. Improved film properties were claimed when the plasticizer content was reduced from 40 to 10 parts.

The improved tensile, elongation, and modulus of 2-3 mil film made by the extrusion method, as compared to calendered film, were pointed out. The preparation of extruded, lay-flat film tubing in the range of 1-2 mils thickness was demonstrated, and the appearance and the strength of this film were emphasized.

The lack of non-toxic stabilizers has limited the use of extruded film for food packaging. Marvinol VR 10 resin was recommended for the manufacture of packaging film by extrusion.

Mr. Hansen discussed the present market for vinyl film, its record in 1951, and its future. This speaker claimed that these thin films would replace more expensive and scarcer films made from resins of limited availability.

Business Today and Tomorrow

The Miami Valley Section, SPE, met at Eaton Manor, Hamilton, O., April 3, to hear Ed Wimmer vice president, National Federation of Independent Business, Inc., speak on "Independent Business in Tomorrow's Market Place."

Mr. Wimmer said that what America needs today is a new national conscience and that we need to restore individual enterprise, initiative, and local control over local affairs. He claimed that big business, big government, and the present-day power of organized labor, coupled with confiscatory taxation, is liquidating the American middle class and impoverishing millions of lower income families.

The speaker called for corrective action involving more vigorous enforcement of the Clayton and Robinson-Patman Acts, and other legislation designed to assure fair competition and equality of opportunity for all in the market place.

Reed Discusses "Royalite"

Speaker for the April 15 meeting of the Toronto Section, SPE, at the St. St. Regis Hotel, Toronto, Ont., was D. W. Reed, footwear and general products division, United States Rubber Co., Chicago, Ill., who spoke on "Fabrication of 'Versalite.'" The name "Versalite" is the Canadian trade name for "Royalite," a gum plastic, known by the latter name in the United States.

Mr. Reed first mentioned that U. S. Rubber's Royalite was added to the family of plastics about 12 years ago. The new material was tough without being brittle and was first used as a backing board for self-sealing fuel cells in World War II. He next reviewed the more recent postwar uses of Royalite.

Manufacturing, fabricating techniques, and fabricating equipment required were then described. Mixing is done in a Banbury mixer, followed by calendering of thin sheets of stock, which are then plyed up in a press to the desired thickness and finish—smooth or embossed—in a variety of colors. Forming may be accomplished by the use of male and female molds, usually with vacuum, with the plug and ring and combinations of the various conventionally used methods. The material is heated in an oven to about 300° F., at which point it is flexible and rubbery and ready for forming or drawing. Finishing tools usually required are band saws, table saws, shears, etc.

The speaker then outlined how and where Royalite was marketed and in what form. Many items fabricated from Royalite were shown.

Mr. Reed presented the same talk on April 17 at the Queen's Hotel, Montreal, P.Q., before a combined meeting of The Quebec Rubber & Plastics Group and local sections of SPE and The Society of the Plastics Industry.

CALENDAR

May	16.	Buffalo Rubber Group; Ontario Rubber Section. C.I.C. International Meeting. Hotel General Brock, Niagara Falls, Ont., Canada.
May	21.	Washington Rubber Group. Potomac Electric Power Co. Bldg., Washington, D. C. New York Section, SPE. Hotel Gotham, New York, N. Y.
May	23.	Newark Section, SPE. Dinner-Dance. Essex House, Newark, N. J.
June	2-4.	The Chemical Institute of Canada. Thirty-Fifth Annual Conference and Exhibition. Mt. Royal Hotel, Montreal, P.Q., Canada.
June	7.	Southern Ohio Rubber Group. Summer Outing.
June	7-8.	The Los Angeles Rubber Group, Inc. Annual Outing
June	9-21.	International Organization for Standardization. Triennial Meeting. Columbia University, New York, N. Y.
June	12.	New York Rubber Group. Annual Outing.
June	13.	Fort Wayne Rubber & Plastics Group. Golf Outing.
June	20.	Akron Rubber Group. Annual Outing. Firestone Country Club. Boston Rubber Group. Summer Outing. Andover Country Club, Andover, Mass.
June	23-27.	American Society for Testing Materials. Annual Meeting. Statler and New Yorker Hotels, New York, N. Y.
June	26.	Rhode Island Rubber Club. Summer Outing. Metacomet Golf Club, East Providence, R. I.
June	27.	Detroit Rubber & Plastics Group, Inc. Golf Outing. Forest Lake Golf Club. Washington Rubber Group. Golf Tournament. Annapolis Roads Club, Annapolis, Md.
July	22.	Buffalo Rubber Group. Summer Outing. Transit Valley Country Club.
Aug.	5.	New York Rubber Group. Golf Tourney.
Sept.	8-10.	American Standards Association. Third National Standardization Conference. Museum of Science & Industry, Chicago, Ill.
Sept.	9-13.	Seventh National Chemical Exposition. Coliseum, Chicago, Ill.
Sept.	25.	Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.
Oct.	3.	Detroit Rubber & Plastics Group, Inc.
Oct.	6-10.	National Hardware Show. Grand Central Palace, New York, N. Y.

SPI Vinyl Film Standard and Trade Practice Rules

AT A meeting held in the Hotel Astor, New York, N. Y., April 22, attended by more than 100 representatives in the vinyl plastic processors branch of the plastic industry, a Vinyl Plastic Film Standard and a general plan for Trade Practice Rules were presented by The Society of the Plastics Industry, Inc.

The Vinyl Film Standard is now in the process of being approved by the interested membership of the SPI. Following this approval, it is intended that this proposal be forwarded to the United States Department of Commerce to be promulgated as a voluntary industry standard. Roger C. Boyd, Bakelite Co., division of Union Carbide & Carbon Corp., reviewed the activities of the Plastics Film, Sheeting and Coated Fabrics Division of the SPI, in connection with the development of standards for these materials, at the April 22 meeting. The proposed vinyl film standard follows:

PROPOSED SPI COMMERCIAL STANDARD FOR GENERAL-PURPOSE VINYL PLASTIC FILM

Property	Method	Limit
Thickness	SPI	±10%
Yield	"Calculated"	Complete rolls ±5% Short length ±10%
Width	Steel type	On core, $\pm 1/2$", —0"
Elevated temperature shrinkage	SPI	7% max.
Crocking	AATCC	No perceptible transfer
Heat sealing		Readily sealable
Tensile strength	ASTM D882-49T, Method B	2100 psi, min.
Ultimate elongation	ASTM D882-49T, Method B	150%, min.
Tear resistance	ASTM D689-44	180 gms. or 60 gms./mil
Plasticizer volatility	SPI	3 mil—10% max. 4 mil— 9% max. 6 mil— 7.5% max. 8 mil— 5% max.
Water extraction	SPI	1%, max.
Low temperature impact	SPI	80% OK at 0° F.
Flammability	SPI	5 sec., min.

In commenting on the above standard, Mr. Boyd said that those in the technical groups of the SPI responsible for the development of the specification felt that very positive progess had been made, and that this activity will result in a definite contribution to the quality levels and uniformity of the film in industry and in the consumer market.

The Trade Practice Rules were presented to the meeting by Alvin V. Roberts, vice president of Ross & Roberts, Inc. The rules were prepared by an SPI committee; Allan S. Hubbard, of the law firm of Hughes, Hubbard & Reed; and by members of the Society's staff. A plan for these rules was first presented at the December, 1951, meeting of the Vinyl Film Division, SPI, by William T. Cruse, executive vice president of the Society, who spoke on the necessary preliminary steps and the procedure for promulgating such a voluntary industry set of regulations. They are being patterned after the Worth St. Rules of the textile industry, and the committee has the legal assistance, at this time, of the law firm that prepared the Worth St. Rules.

The Trade Practice Rules committee met several times in the past few months in order to draw up a proposed draft of an acceptable sales note agreement, which would incorporate the salient and necessary legal clauses of the Worth St. Rules and at the same time contain additional legal phraseology required for the plastics

(*Continued on page 246*)

Scientific and Technical Activities

ASTM Fiftieth Anniversary Meeting to Include Symposium on Rubber

DEDICATED to the cause of quality control and standardization of test methods in engineering materials, the American Society for Testing Materials will celebrate its fiftieth anniversary at its annual meeting during the week of June 23 in New York, N. Y. The headquarters hotels will be the Statler and the New Yorker.

The technical program will consist of symposia sponsored by the various ASTM committees including those on concrete, soils, industrial water, adhesives, plastics, and rubber, to name but a few. Subcommittee and committee meetings will also be held, and there will be apparatus and photographic exhibits, entertainment program, laboratory visits, etc.

Detlev W. Bronk, president of Johns Hopkins University and president of the National Academy of Sciences, will be the speaker at the anniversary dinner scheduled for Wednesday, June 25.

The annual address of the president of the Society, T. S. Fuller, messages of greeting from two representatives of national and foreign bodies, together with presentation of awards, will feature the luncheon session, Tuesday, June 24.

Committee D-11 on Rubber and Rubber-Like Materials has arranged a symposium on the subject of "Recent Developments in the Evaluation of Natural Rubber," to be held on Thursday afternoon, June 26. The chairman of Committee D-11 is Simon Collier, Johns-Manville Corp., and the chairman of the symposium committee is Norman Bekkedahl, National Bureau of Standards.

Committee D-11 Symposium

THURSDAY, JUNE 26, 1952

2:00 p.m. **Introductory Remarks.** Norman Bekkedahl.

2:10 p.m. **Technical Classification of Crude Natural Rubber.** R. G. Newton, International Rubber Research Board, Welwyn Garden City, England. (Paper to be presented by L. Mullins, British Rubber Producers' Research Association.)

The paper presents a progress report on the developments which have occurred in the 12 months since the last report was made to subcommittee 12 of Committee D-11. The supply position has been improved, and consumer evaluations have confirmed the value to them of classification by modulus tests. Classification by processability measurement is still a considerable problem, which will receive discussion in the paper.

Recent worldwide interlaboratory comparisons have thrown light on the problems of standardizing Mooney and modulus testing, and have emphasized the difficulties of standardizing high elongation tests. The information gained from these comparisons will be related to present standardizing procedures.

The trend in development of future policy concerning T. C. rubber and of improving the coordination between producer and consumer will be discussed.

2:45 p.m. **Mooney Viscosity Measurements of Technically Classified Rubbers.** Rolla H. Taylor, United States Department of Agriculture, Salinas, Calif., and **A. G. Veith,**[1] B. F. Goodrich Co., Akron, O.

Mooney viscosity measurements of Technically Classified natural rubbers are essentially in the same state of development as was the Mooney viscosity measurements on GR-S in 1944. We have a machine capable of doing the job. All too frequently, however, the user fails to understand the necessity of strict adherence to operational details if meaningful data are to be obtained.

This paper reviews the methods of adjusting and operating the machine. The effects of such things as die closure, calibration, temperature, dimension of parts, and sample preparation are discussed.

The adequacy of any single value of Mooney viscosity as an indication of the processability of rubber is open to question. It is shown that the various grades of T. C. rubbers break down during the mastication at different rates, which are apparently related to the proportion and kind of non-rubber materials present. It is suggested that a "processability index," based on both viscosity and rate of break down under some prescribed set of conditions, would be a more useful and meaningful measure of processability than the original viscosity alone.

3:10 p.m. **Technically Classified Rubber—The Non-Rubber Content and the Measurement of Cure Rate. A. G. Veith.**

This characterization has shown that the non-rubber content of a typical set of samples of T. C. rubber increases in the order of Red, Yellow, and Blue. Increased quantities of these non-rubber materials appear to promote faster rates of cure. The rate of cure of these samples of T. C. rubber has been measured by several methods; all methods yield data in qualitative agreement. The application of a new approach to the general problem of rate of cure, as outlined by G. Gee, BRPRA, has been made. Data are presented which indicate that two of the parameters of Gee's equation for the calculation of cure rate are amenable to measurement with the Mooney viscometer at moderate curing temperatures, when the A. C. S. No. 1 type of mix is used.

It is suggested that the Mooney viscometer be given consideration as an instrument for the measurement of cure rate. If it is adopted, a considerable reduction in testing time can be effected.

3:30 p.m. **Five-Minute Recess.**

3:35 p.m. **Vulcanization Characteristics of Natural Rubbers.** Robert D. Stiehler and Frank L. Roth, NBS.

Three methods are being considered for the evaluation of natural rubber. The one advanced by B. F. Goodrich[2] is based on the change in Mooney viscosity during the initial vulcanization period. This method determines two parameters, a time of incipient cure and the initial rate of cure after vulcanization starts. The second method, proposed by G. Gee, is based on the Mooney viscosity of the compound and the time of cure and value for maximum modulus of the vulcanizates. Two parameters are determined, a rate constant and the maximum modulus. The third test is based on the strain test developed by the National Bureau of Standards.[3] Three parameters are calculated from the strain data, a time of incipient cure, a rate constant, and a structure factor somewhat analogous to the maximum modulus of the second method.

Four rubbers (pale crepe, sprayed latex, smoked sheet, and Tensorub, a high-quality smoked sheet produced by Socfin) were evaluated by these three methods. The evaluations were made for two times of storage before vulcanization, two ambient humidity conditions during storage, and two temperatures of vulcanization. The investigation was confined to the use of the standard A. C. S. No. 1 recipe. Measurements were made of Mooney viscosity of the compound at 100°C.; the change in Mooney viscosity with time at 125 and at 140° C.; the strain at 100 psi.; stress at 100%, 600%, and at failure; and the elongation at failure of vulcanizates cured 12, 15, 20, 30, 45, 90, and 180 minutes both at 125 and 140° C. The stress at 100% was measured by means of an Instron tester using strain specimens.

4:00 p.m. **Quantitative Procedures for the Determination of Dirt in Crude Natural Rubber.** R. P. Stock and C. B. McKeown, Goodrich; **C. O. Miserentino,** Dunlop Tire & Rubber Corp., Buffalo, N. Y.; and J. J. Hoesley, Goodyear Tire & Rubber Co., R. T. LaPorte, Seiberling Rubber Co., and G. H. Wallace, Firestone Tire & Rubber Co., all of Akron.

Subcommittee 12 of Committee D-11 appointed a task group to study methods of determining foreign material (sand, dirt, bark, etc.,) in crude natural rubber. This group provided test procedures and blended samples to six cooperating laboratories for evaluation. The results of this round-robin testing program indicate two methods which give reproducible data within practical limits.

Both of the selected methods reduce the solid crude rubber sample to a liquid which can be strained through a 325-mesh screen. The amount of dirt retained on the screen may then be determined. The main difference in the two methods are in the size of sample and in the method of liquefying the rubber. The first method uses a 20-gram sample dissolved in solvent. The second method uses a 454-gram sample melted by thermal decomposition, using oil as a heat exchange medium and diluent.

It is not within the scope of this paper to examine the usefulness or need of the proposed determinations. However certain practical problems are presented.

4:20 p.m. **Preparation of a Standard Natural Rubber.** E. M. McColm, United States Rubber Co., New York.

Various possible methods are discussed for producing a standard natural rubber, and a detailed decription is given of the procedure used in preparing a uniform rubber by spraying a bulked lot of creamed, formaldehyde-preserved latex. Three test lots of dry rubber from this single lot of bulked latex have been prepared and subsequently tested at NBS. The data indicated that satisfactory uniformity had been achieved.

4:40 p.m. **Some Aspects of the Testing of Natural Rubber.** L. V. Cooper and **T. M. Kersker,** Firestone.

Many rubber technologists still use tensile determinations on the crude rubber

[1] Names in bold face indicate person presenting the paper.

[2] India RUBBER WORLD, Nov., 1947, p. 216.

[3] *Ibid.*, June, 1948, p. 367.

A. C. S. mix as a criterion of quality. To obtain the correct tensile figures certain precautions must be taken to eliminate practices and conditions which tend to give premature breaks. The first part of the paper deals with the technique employed at Firestone to get consistent high results.

Much has been written on the evaluation of the effect of exposure to weather on cured natural rubber and synthetic substitutes. The second part of the paper discusses the design and operation of the Firestone weathering machine, which we feel can simulate any single condition or combination of conditions which rubber products may encounter in service. These conditions are: ozone concentration up to 250 parts per 100 million at normal temperatures; flexing at various speeds up to 150% stretch; temperature variation from —40 to +212° F.; simulated sunlight as produced by G-E AX-6 bulbs; relative humidity from 30 to 100%, and any static stress.

5:05 p.m. **Rubber Evaluations with an Instron Tester.** S. D. Gehman and R. P. Clifford, Goodyear.

An investigation was undertaken to explore new opportunities for the evaluation of rubber from its stress-strain characteristics with an Instron tester. The resistance strain-gage load recording system and the flexibility of control of the crosshead motions introduce a variety of possibilities not available with the usual pendulum type of rubber tester.

Accurate recording of the load-elongation curves for low elongations is of particular interest for many technical applications. Reproducible deformation histories can be applied readily to test specimens, and the effects on load-elongation curves observed. The transient character of the first stretch load-elongation curve usually used in rubber testing is apparent by comparison with equilibrium curves after repeated cycling. The facility with which such data can be obtained makes use of equilibrium curves feasible. Load relaxation at constant elongation can be recorded directly. Creep at constant load can also be determined, or creep curves may be deduced from the effect of rate of elongation on the load-elongation curves. The low load ranges available and the smooth cross-head motion enable reproducible recording of load-elongation curves for raw rubber and compounds. These results have significance for some phases of processability. Use of a small ring-shaped test piece provides an elegant technique for sampling the tensile properties of the rubber in vulcanized rubber articles. Hysteresis may be evaluated by recording the decay of the vibratory load for the free vertical vibrations of a test specimen and attached mass, or hysteresis determinations can be made over large ranges of amplitude by recording load-elongation cycles and measuring areas. Compressive as well as tensile loading may be used.

Illustrative results from these various procedures are given to point out the versatility and flexibility in testing with this equipment. They indicate important fields of usefulness for it in rubber testing other than routine testing for ultimate elongation and tensile strength for which it is not particularly well adapted.

Litzler and Osberg Address New York Group

THE spring meeting of the New York Rubber Group was held April 4 at the Henry Hudson Hotel, New York, N. Y., with J. S. Corrigall, R. T. Vanderbilt Co., chairman of the Group, presiding. The afternoon technical program, which began at 4:00 p.m., consisted of a talk on "Surface Coating and Impregnation of Flexible Web Fabrics," by C. A. Litzler, president, Industrial Ovens, Inc., Cleveland, O., and a talk on "Polygen—A New Class of Synthetic Rubber," by Edward V. Osberg, assistant manager, chemical division, General Tire & Rubber Co., Akron, O.

Entertainment after dinner was provided by "The Incredible Dr. Jaks," psychologist, lecturer, and entertainer, who furnished an enjoyable concluding portion to the afternoon and evening program.

In his talk Mr. Litzler first explained that basically there are four fundamental types of surface coating methods, as follows: (1) knife coating; (2) reverse and direct roll coating; (3) rotogravure coating; (4) combinations of the previous three types. He said the coating machines employed in these methods are used for the application of rubber compounds, organosols, and vinyls to fabrics and papers.

After coating, the solvent material must be removed from the coating, and this step normally performed in single and two-zone evaporating units, which are of many types and variations. It was pointed out that heating of the coated material in the ovens could be accomplished by low-temperature steam radiation, gas, or electric infrared radiation or convection.

Because of present-day increased operating speeds, the fabric handling elements in a coating system are important, and the most commonly used handling elements are continuous unwind stands, tension control units, water cooled pull rolls, low- or high-pressure embossing units, fabric storage accumulators, and continuous take-ups. These units must be carefully integrated in a complete processing line if maximum operating economy is to be obtained.

The several methods of accomplishing the saturation of fabrics fall into three categories: (1) long impregnation time at low tensions; (2) short impregnation time at medium tensions; (3) short immersion times at high tensions. The time and the tension used depend upon the materials being impregnated or saturated.

The after-drying units are usually horizontal, straight-through dryer types, double inverted arch types, straight fixed roll festoon types and drum types, or combinations of all three types may be used.

In conjunction with saturating of various types of rubber goods, there is an increase in the tendency to calender rubber compounds on to the fabric in-train with the saturating unit, Mr. Litzler declared. This method assures economy of operation due to the lack of attendant labor and the high processing speeds this arrangement provides. A perfect example of this type of operation is the impregnation, calendering and cementing of tire cord.

In present-day operations in coating and saturating, there is need of further research and cooperation among the manufacturer of materials, the processor of the materials, and the equipment builder. With such cooperation, reduced costs are very easily possible. Speeds of 100 yards a minute are distinct realities, Mr. Litzler said in conclusion.

Much of the material presented in Mr. Osberg's talk has been published in the June, July, and August, 1951, issues of India RUBBER WORLD and in the December, 1951, issue of *Rubber Age* by workers at General Tire and Polymer Corp., Ltd. In addition, the speaker emphasized that Polygen-type rubbers for mechanical goods applications made with special additives other than petroleum oils were now in the process of development, and that manufacturers of rubber chemicals should give consideration as to how their present or future products might fit into the Polygen rubber development.

The economic aspects of the oil-enriched synthetic rubbers with special reference to the savings in cost and the more efficient use of existing synthetic rubber production facilities were also covered.

Le Bras Speaker at Cabot Seminar

JEAN LE BRAS, head of the French Rubber Institute and editor of the *Revue Générale du Caoutchouc*, both of Paris, France, was guest speaker at a seminar recently held by Godfrey L. Cabot, Inc., in Boston, Mass.

In his opening remarks Dr. Le Bras referred to his recent tour of the Far East and paid tribute to the valor and courage of the rubber growers and technologists of Indo-China who have maintained production and conducted research, despite the great military opposition of antagonistic political forces there.

He then went on to discuss the reasons that have led the rubber growers to place on the market "technically classified rubbers." This system of classification allows the manufacturer to select the particular grade of rubber best suited to his specific needs and is the first step toward the preparation of plantation rubber of much greater uniformity and improved properties. More than 4,000 bales of these T. C. rubbers have been placed on the American market under the overall commercial classification of The Rubber Manufacturers Association, Inc., for #1 Ribbed Smoked Sheet, and at no increase in price.

Dr. Le Bras was enthusiastic about a new method of direct reinforcement of rubber latex which he pointed out yields vulcanizates with mechanical properties superior to those obtained by the usual milling procedures. The French Rubber Institute, with the assistance of French tire manufacturers, has produced test tires with treads prepared by this method, as well as various types of conveyor belting. Preliminary tests have been encouraging. He spoke also of research now under way which demonstrates that the addition of certain fillers such as mica and aluminum powder greatly improve the permeability characteristics of natural rubber inner tubes.

Guests at the seminar included C. C. Davis, editor, *Rubber Chemistry and Technology*, various members of the Boston Rubber Group, and representatives of American Oil Products Co., Tracerlab, Inc., Simplex Wire & Cable Co., and Harvard Business School.

Conference of Canadian Rubber Chemists

THE Rubber Chemistry Division of the Chemical Institute of Canada is holding a one-day meeting at the Mount Royal Hotel, Montreal, P.Q., June 4, as part of the meeting of the parent organization. N. W. Smith, Dominion Rubber Co., Ltd., is chairman of the Division and will preside. American technologists are especially invited to these meetings.

The program and titles and abstracts of the papers to be presented together with the authors and their affiliation follow:

9:30 a.m. **The Evolution of the Inner Tube.** W. E. Ireland, B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont. (Abstract of this paper not available at time of writing).

10:00 a.m. **Trace Elements in Natural and Synthetic Rubbers.** A. R. Dabald, Dominion Rubber.

Natural rubber contains trace elements as do most biological products. Irrigation, creping, and various purification methods add to the trace metal content. Coagulants of the latex may also add trace metals to synthetic rubbers. Compounding ingredients are another major source of metal contamination. Although some forms of trace metals are harmful to rubber, others show little or no effect.

The major deterioration induced by the presence of harmful trace metals is associated with oxygen absorption by raw and vulcanized rubbers, but, as is pointed out in this paper, many are the ways in which absorbed oxygen alters rubbers. From a practical point of view, however, it is the deterioration of the physical properties of rubbers that is the major concern of the rubber compounder and the manufacturer of rubber goods.

The mechanism of oxidative degradation of aromatic and of simple mono-olefins is reviewed, and the parallelisms found in oxidation of rubbers are outlined. The presence of certain trace elements has a marked effect on this mechanism, and the manner in which auto-oxidation is altered suggests methods of deactivating undesirable trace metals. The assistance of antioxidants in such a scheme is likewise reviewed.

10:30 a.m. **The Influence of Chemical Rubbers on Winter Driving.** N. S. Grace and G. Winter, Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.

The emergency of the last war first introduced chemical rubber tires to the public who were critical of their deficient traction on ice and snow. Many investigators have studied this problem both in the laboratory and the field. With the variety of winter conditions that may exist, evaluation becomes very complex. Field tests with vehicles add to the complexity, but such tests favored because of the difficulty of translating laboratory frictional values into road performance or user reaction.

The work of the National Safety Council in the United States is reviewed to illustrate some of the results of careful measurement of the ability to stop and to go under a variety of conditions.

A relatively simple field method of evaluation requiring no expensive equipment has been developed and is described. High precision is not claimed, but it has served as a useful guide in evaluating what the public's reaction might be to a variety of tire tread compounds.

The original GR-S has been compared with newer chemical rubbers, also with blends with natural rubber, using natural rubber tires as controls.

The conclusion is reached that among the newer chemical rubbers of improved characteristics now available, the gap in winter traction that existed between the original GR-S and natural rubber has been substantially reduced.

11:00 a.m. **Butyl Rubber in Mechanical Rubber Goods.** E. D. Jackson, Stokes Division, General Tire & Rubber Co. of Canada, Ltd., Welland, Ont.

Butyl rubber, widely used for the manufacture of inner tubes for motor vehicle tires, has been found useful also for the production of various types of mechanical rubber goods. The butyl rubber used in these products is of the type having a high curing rate and a Mooney viscosity in the range of 70-80.

The excellent resistance to deterioration by sunlight of properly compounded and processed butyl rubber makes it a desirable material for rubber goods exposed to sunlight in service.

Intricate extrusions may be made of butyl rubber compounded with FEF carbon black and relatively large proportions of liquid plasticizers. These extrusions hold their shape and sag very little, in open steam cures, even in fairly low hardness compounds.

For rubber goods to be exposed to elevated temperatures in service, butyl rubber has been found very satisfactory when compounded in the correct way. Butyl rubber may also be compounded to produce materials having low compression set characteristics.

A very satisfactory procedure has been developed for mixing butyl rubber compounds containing large proportions of liquid plasticizer, by which the carbon black is dispersed to the degree required for maximum resistance to sun cracking.

It is felt that as more is learned about the properties of butyl rubber compounds, this materials will be used for the manufacture of an increasing number of types of mechanical rubber goods.

11:30 a.m. **Business Meeting of the Division.**

2:00 p.m. **The Electrostatic Properties of Plastics.** H. A. Endres and W. T. Van Orman, Goodyear Tire & Rubber Co., Akron, O.

This paper will review the development of electrostatic charges in rubber and the phenomena accompanying electrostatic discharge. The relation of the electrostatic properties of materials to surface resistivity, the effect of relative humidity, and the influence of chemical composition (polarity) will be discussed. The mechanism of dust collection on plastics due to electrostatic charges and the use of destaticizing treatments will be described. The utilization of this troublesome property of plastics in self-charging electrostatic air filters for removing highly dispersed particulate matter from the atmosphere will be dealt with.

Air filters composed of electrostatic materials in suitable form offer an economical means of removing dust, soot, and smoke from the air when used in conventional forced draft heating, ventilating, and air conditioning systems.

Such filters function by electrostatic attraction and precipitation and are therefore effective throughout their entire thickness. They are easily cleaned and can be reused without deterioration of their electrostatic properties.

2:30 p.m. **The Errors of Stress-Strain Testing.** S. T. Bowell and I. C. Rush, Polymer Corp., Ltd., Sarnia, Ont.

The physical tests specified for grading general-purpose synthetic rubber include determinations of tensile strength, elongation at break, and modulus at 300% extension at different times of cure. For many years it has been suspected that the errors associated with these measurements, even when the tests were conducted by a rigidly specified procedure, were so large, compared to probable variations occuring in the quality of the lots, that the tests were of little value.

A cooperative program between Polymer Corp. and the Department of Mathematical Statistics of the Ontario Research Foundation was conducted to determine the magnitude of the errors of the tests and to determine the contribution of each step in the procedure to the total error of the final result. In this paper the magnitude of the component of final test error introduced by each step is listed together with the precautions employed at each step to hold test variability to a minimum.

It is pointed out that the errors for each test are so great and particularly so unpredictable that the results should not be used as a basis for action, such as rejection of a lot or blending of several lots.

3:00 p.m. **Elastomeric Products from "Thiokol" Liquid Polymers and Ethoxyline Resins.** J. S. Jorczak, Thiokol Corp., Trenton, N. J.

Among the newest resin development, a very versatile class is the ethoxyline resins. Several commercial grades have been used successfully with "Thiokol" liquid polymers. The interaction between the two materials occurs by addition, and there are no by-product and very little shrinkage. Liquid polymers of low viscosity can be converted to rubber-like semi-rigid and rigid (non-brittle) compositions. The products have exceptional properties for use as adhesives, embedment compounds, and coating compounds.

The liquid mixtures will convert at temperatures ranging from 40 to 150° F. The reaction is exothermic, and control is maintained by choice of catalysts which vary in activation effect.

3:30 p.m. **Truck-Bus Tires Today.** H. T. Humby, Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont.

This paper gives practical suggestions for lower-cost operating with present-day truck and bus tires. Subjects discussed follow: (1) tire cost per mile; (2) how retreading can reduce cost per mile; (3) functional ability of a tire to carry load; (4) what is meant by overloading a tire; (5) inflation pressure and its effect on mileage; (6) relation of inflation pressure to speed and terrain; (7) body strength—the evolution of rayon in truck tires; (8) selecting tires for lowest cost per mile; (9) rims and their effect on tire life.

Outlook Good for Rubber

THE spring dinner-meeting of the Akron Rubber Group took place at the Mayflower Hotel, Akron, O., April 4. D. F. Behney, Harwick Standard Chemical Co., chairman, presided and introduced the speaker of the evening, Paul E. Belcher, vice president and cashier of the First National Bank of Akron, who discussed "The General Outlook for Rubber."

Mr. Belcher stated that the rubber in-

dustry along with the general economy does not face an early recession. Sales outlook for the rubber industry is good, he declared, as the companies continue to broaden their base and go into other fields. The nation faces another round of wage increases, however, and these wage increases will be followed by still higher prices, the speaker warned. He predicted that the steel industry would grant a substantial increase in wage levels which would bring about higher steel prices, followed by similar increases in the chemical, rubber, oil, and other industries.

Although these increases in wages will be passed on to the consumer in the form of higher prices in another inflation spiral, there will be greater business activity during the last half of 1952, it was said.

In order to overcome the general sales resistance that has developed against rising prices, industry will undoubtedly bring out lower-quality product to stimulate sales. At the same time business will continue to have the problems of checking the ever-climbing cost level and of keeping profits up in face of greater taxes, the speaker concluded.

Following Mr. Belcher's talk, Prof. Sam Selby, head of the mathematics department of the University of Akron, entertained the Group with tricks with numbers.

Door prizes were won by A. C. Eide, American Zinc Sales Co., and Frank Bell, B. F. Goodrich Chemical Co. Tickets to a Center Theater Guild of Akron play were won by J. E. Kuebler, *Akron Beacon Journal*; K. M. Deal and Paul Beebe, both of Goodyear Tire & Rubber Co. The tickets were donated by Henry M. Rose, H. Muehlstein & Co.

New officers of the Group, to take office in September, 1952, were elected as follows: chairman, L. M. Baker, General Tire & Rubber Co.; vice chairman, Roy H. Marston, Binney & Smith Co.; secretary, V. L. Petersen, Goodyear; and treasurer, F. W. Gage, Columbia-Southern Chemical Corp.

It was announced that the Akron Group now has 1,289 members, the largest number in its history and two more than last year's peak.

The Group's annual outing will be held Friday, June 20, at the Firestone Country Club. A varied program of activities is planned by William V. Sauter, E. I. du Pont de Nemours & Co., Inc., general chairman for the affair.

Neoprene Discussed

THE Washington Rubber Group meeting of April 16, held in the Pepco Building, Washington, D. C., featured three speakers from the rubber chemicals division, E. I. du Pont de Nemours & Co., Inc., who discussed "Neoprene: Its History, Production and Properties." The three speakers were M. A. Youker, N. L. Catton, and R. A. Kurtz. An informal dinner for friends of the speakers was held before the meeting, at Touchdown Club.

Dr. Youker, who not only witnessed the birth and growth of neoprene, but has in a large measure directed the research which led to the development of many of the improved types of neoprene now commercially available, began the program with a short history of neoprene's origin and the subsequent development of particular types to meet specific requirements. He discussed the work of Father Nieuwland at Notre Dame which resulted in the polymerization of acetylene, the first full-year of production in 1933 when 12,000 pounds was made, and the introduction of neoprene latices in 1936. The first neoprene plants in Deepwater, N. J., and the neoprene plants in Louisville, Ky., were also discussed.

Mr. Catton continued the talk by treating of the low-temperature characteristics of neoprene. He divided the physical changes that take place when neoprene is exposed to low temperatures as follows: (1) simple temperature changes which are rapid and completely reversible; (2) second-order transition which occurs at —20 to—40° C. and also takes place rapidly, characterized by hardness and stiffness, but is completely reversible; (3) crystallization which takes place most rapidly at 32° F., and the rate of which can be increased by placing the sample under stain; (4) plasticizer time effect.

Values for the four above properties on samples of neoprene types W, WRT, GN, and GR-S, butyl, and nitrile rubbers were compared. Catton concluded his discussion by explaining how laboratory tests on rubbers can sometimes be misleading and how the recognition of the need of performance testing is increasing.

Dr. Kurtz concluded the program with a discussion of neoprene compounding and products. He gave a comparison of properties for natural rubber, GR-S, nitrile rubber, butyl, and neoprene, which showed neoprene to be in the good or exceptional class for such properties as low temperature characteristics compression set, flex life, resiliance, oxidation resistance, and heat resistance. This portion of the program included slides of practical applications of the neoprene characteristics.

An additional feature of the meeting was the showing of the color and sound film "Neoprene," a du Pont production.

Stereo Photography

THE Rhode Island Rubber Club held its spring meeting at Metacomet Golf Club, East Providence, R. I., April 21, with 155 members and guests in attendance. The program consisted of a talk and demonstration of stereo photography and projection by C. E. Bearse and W. R. Porter, of Worcester Film Corp., Worcester, Mass.

After dinner, gifts were presented to past presidents of the Club, including Harry A. Schlosser, Berlow & Schlosser, Providence, 1949-50; Fred Bartlett, United States Rubber Co., Bristol, 1950-51; and Fred Newman, Respro Corp., Cranston, 1951-52.

Mr. Bearse explained that Worcester Film's contribution to the art of stereo photography had been the working out of a complete mathematical expression for calculating the interoccular distance necessary for taking the two pictures simultaneously to produce the desired stereo effect on the screen. For hand viewers, the wooden "fence" of the old stereopticans is still used to prevent the left eye from seeing the picture the right eye sees, but for projection the separation is accomplished by taking the two pictures through polarizing filters arranged at 90 degrees and viewing them through similarly polarized eye glasses. The company, in cooperation with Eastman Kodak, has designed and produced both new cameras and projection equipment for this type of photography.

Industrial uses of stereo photography include educational films for sales work, instructional films for assembly operation teaching, and the preparation of easy-to-visualize pictures of rather intricate machinery.

Mr. Porter operated the equipment, which included both stills and movies in kodachrome, to demonstrate the talk.

The summer outing of the R. I. Rubber Club will be held at Metacomet Golf Club on June 26.

Symposium on Machinery

A JOINT meeting of the Ontario Rubber Section of the Chemical Institute of Canada and the Wellington-Waterloo Rubber Group was held at the Signet Restaurant, Kitchener, Ont., Canada, on April 8, with 100 members and guests present.

The program consisted of a symposium on "Rubber Machinery and Equipment," with H. W. Knechtel, Dominion Rubber Co., Ltd., Kitchener, as moderator. Members of the panel were W. T. Holgate, Canadian General Electric Co., Ltd.; H. G. Olson, Taylor Instrument Cos.; and W. S. Snyder, Dominion Rubber.

Each member of the panel first gave a short talk on machinery and equipment as used in the rubber industry. Very many questions, some submitted in advance and others from the floor, were answered by appropriate members of the panel. The program was voted unanimously as being an outstanding success.

Election of officers of the Ontario Rubber Section for 1952-53 resulted as follows: chairman, J. A. Carr, Dunlop Tire & Rubber Goods Co. Ltd.; vice chairman, H. R. Pletch, B. F. Goodrich Co. of Canada, Ltd.; secretary, W. J. Nichol, Gutta Percha & Rubber, Ltd.; and treasurer, W. H. Bechtel, Kaufman Rubber Co., Ltd. Members of the executive committee also include G. Grushcow, Dayton Rubber Co. of Canada, Ltd.; W. R. Cline, Canadian General Tower, Ltd.; and G. J. Baxter, Firestone Tire & Rubber Co. of Canada, Ltd.

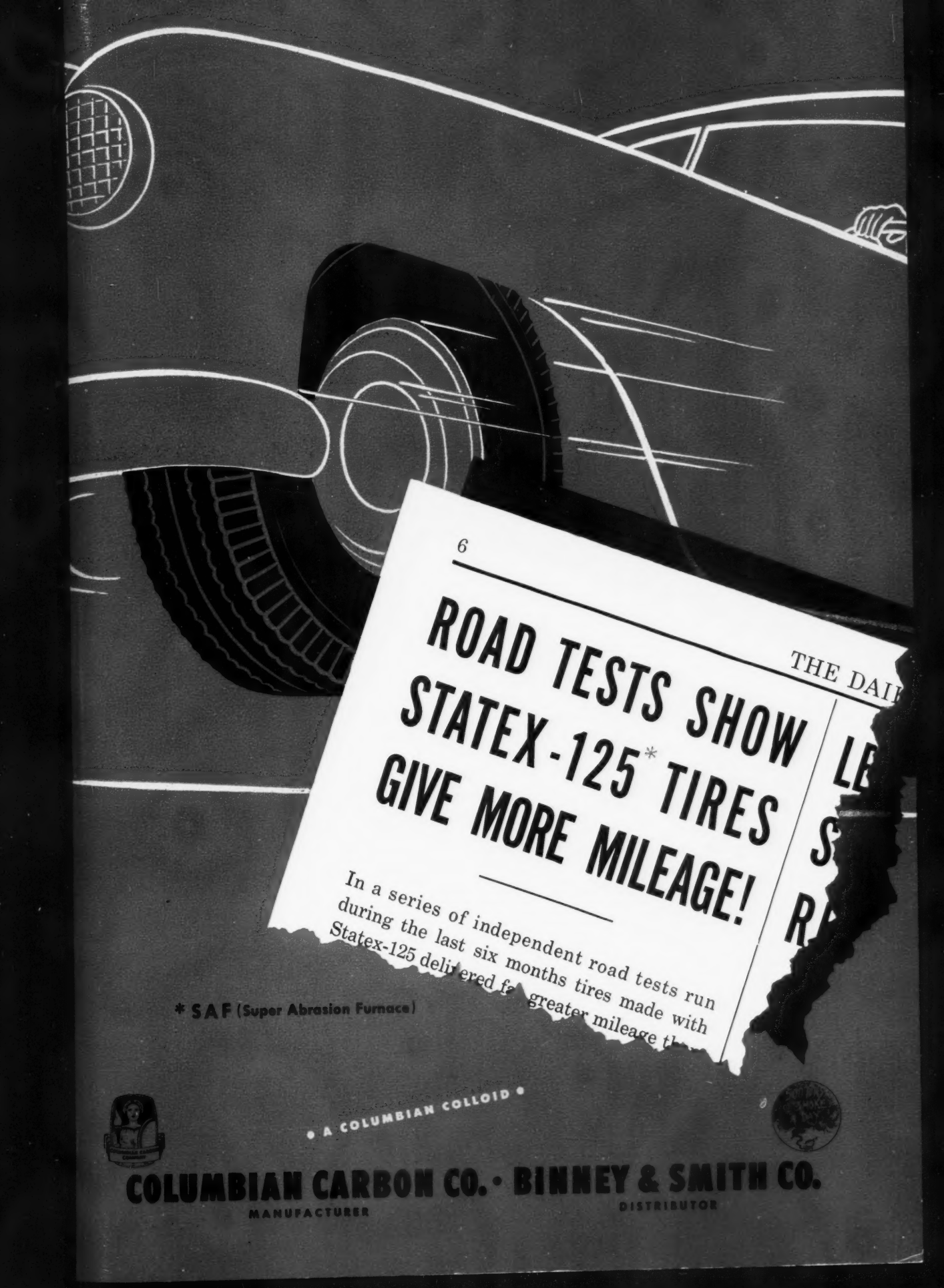
Lockwood Speaks at Quebec

THE Quebec Rubber & Plastics Group held a meeting at the Queen's Hotel, Montreal, P.Q., Canada, March 20, with 90 members and guests present. Speaker for the evening was Warren S. Lockwood, Natural Rubber Bureau, Washington, D. C.

Mr. Lockwood was introduced to the Group by A. Beauchamps, Dominion Rubber Co., Ltd.; and S. McLean, British Rubber Co., Ltd., conveyed the thanks of the Group to him for the talk.

The speaker first outlined the present-day conditions in Southeast Asia in connection with the production of natural rubber. Beginning with one of the ports used for the shipment of rubber, he gave a picture of the various rubber plantations that might be visited in order to get an overall view of the natural rubber industry in Southeast Asia. The general living conditions of the population were discussed, as well as the present difficulties of producing rubber while harassed by considerable bandit activity.

A technicolor film, "Southeast Asia," was also shown.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Sibley, Dobson Speakers at Boston Group Meeting

THE spring meeting of the Boston Rubber Group was held at the Somerset Hotel, Boston, Mass., March 21, with John Andrews, Godfrey L. Cabot, Inc., chairman, presiding. Speakers for the evening were R. L. Sibley, Monsanto Chemical Co., and John G. Dobson, The Foxboro Co.

The treasurer's report was presented by Alan W. Bryant, Binney & Smith Co.; and H. W. Sutton, Boston Woven Hose & Rubber Co., representing James C. Walton, of the same company and director from the Boston area, for the Division of Rubber Chemistry, A. C. S., spoke in connection with the Division meeting in Cincinnati, O., scheduled for April 30 through May 2, 1952, and the Spring, 1953, Division meeting to be held in Boston.

A moment of silence was observed in honor of the following members of the Group, whose deaths occurred in the 1950-1951 period: J. Newton Smith, Boston Woven Hose; David C. Scott, Sr., Scott Testers, Inc.; W. W. Higgins, United Carbon Co; John H. Clark, Hood Rubber Co.; James M. Cooke, Cooke Color & Chemical Co.; Roger Gale, Howe & French; C. M. Grafton, Goodall-Sanford; Frank Jepson, Acushnet Process Co.; and, W. A. Littlefield, Hood Rubber.

Jean le Bras, French Rubber Institute, Paris, France, who was present at the meeting, spoke briefly on rubber production in French Indo-China. He said that rubber production was continuing, but under considerable difficulty, and the conditions did not appear to be improving.

Dr. Sibley in his talk, "The Story of a Rubber Chemical," said that a great volume of study and research work, usually over a long period of time, is necessary in developing and bringing a specialty rubber chemical to commercial use. The findings of a research laboratory are always months, and all to frequently, years ahead of the actual commercial production of a given chemical. This situation is usually due to the high cost and non-availability in commercial quantities of the required raw material. Research, having discovered a suitable product for rubber industry use, must often divert its attention from the end-product to the raw materials required and develop processes for the production of the raw materials, and then by development studies on a larger scale, prove that the processes are soundly chosen.

The desired rubber chemical must then be studied, in turn, and its own manufacturing process proved feasible and commercially practical. When all these requirements have been taken care of, samples of the product may be distributed with confidence for customer evaluation. During this test period commercial-size units for the manufacture of the product and any required raw materials can be installed.

The speaker traced the progress of an accelerator, an antioxidant, and an ultra-accelerator through the above-mentioned procedures and in considerable detail. Compounding test data were shown to demonstrate the reasons for selecting certain products for commercial production and sale.

Mr. Dobson spoke on "Control Instruments in a Rubber Factory." He said four separate types of automatic controllers are available for use in the rubber factory. The first, which would provide cycling control, such as temperature control in a tub of water, provides a simple set point and control point, about which the actual value fluctuates about 4%, on the average.

The second type of control instrument was described as proportional control, and this type could be applied to the control of temperatures in a shower. In this instance the temperature values all deviate a percentage *under* the desired point.

The third-type instrument incorporates a reset function in the system, bringing proportional control to a set point at a fixed rate. It is used, for example, in a counter-current heat exchanger, and exact temperatures are secured.

The fourth-type instrument, called a derivative controller, includes a variable speed of control change, such as would be used in control of a furnace of large capacity, where there is a lag in effect measurement. (Under such conditions type number three would cycle.)

Very many slides were used by both speakers to illustrate their talks.

It was also announced that the annual outing of the Group would be held at the Andover Country Club on June 20. Ed. Covell, Stedfast Rubber Co., is chairman of the outing committee.

A color movie on neoprene was shown before dinner under the direction of John Ledden and through the courtesy of E. I. du Pont de Nemours & Co., Inc.

Following dinner an announcement was made of election of officers of the new Group for the 1952-53 season, as follows: chairman, Daniel Reahard, Jr., General Tire & Rubber Co.; vice chairman, Charles Cougill, Auburn Rubber Co.; and secretary-treasurer, Elmer I. Ramga, United States Rubber Co. Members of the executive committee in addition to the above officers are: D. S. Sherman, U. S. Rubber; Charles Butts, Ball Bros. Co.; John Dixon, Anaconda Wire & Cable Co.; Al Laurence, Phillips Chemical Co.; Tom Pollard, Monsanto Chemical Co.; and Stanley Choate, O'Connor & Choate.

The Fort Wayne Group officers will meet with the executive committee of the Division of Rubber Chemistry, A. C. S., on May 2 in Cincinnati, O., in connection with the application of the Group for sponsorship by the Rubber Division. The new by-laws of the Fort Wayne Rubber & Plastics Group were voted accepted as presented.

Carroll Jackson, Paranite Wire & Cable Division, Essex Wire Corp., was moderator for the panel discussion. The other members of the panel were J. Carlson, also of Paranite, who discussed the dry mixing of plastics in the Speedmullor; W. W. Williams, Monsanto, who discussed the dry mixing of plastics in the ribbon blender; J. L. Foster, B. F. Goodrich Co., who discussed the technique for compounds to be processed as dry blends; and H. E. Buecken, National Rubber Machinery Co., who discussed the design and operation of plastic extruders.

A summer golf outing of the Group is scheduled for June 13.

Instrumentation Symposium

THE Agricultural & Mechanical College of Texas has scheduled its 1952 symposium on "Instrumentation for the Process Industries" for June 2, 3, and 4 at College Station, Tex. Held in cooperation with the many important industrial firms of the Southwest, the meeting is jointly sponsored by manufacturers of instrument and control equipment, who provide extensive exhibits of an educational nature.

The symposium, now in its seventh year, is designed to strike a balance between theory and practical experience, and the program will include subjects related to the measurement and control of process variables, with recognition of new developments and current trends of the industry. The course will be conducted as a seminar, with lectures leading into discussions of various phases of this growing science, making it of important value to instrument, process design, and operating engineers and management executives.

All interested persons are eligible to take this course, with payment of the $6 registration fee. Meals are available at reasonable prices on the college campus. Room arrangements should be made individually.

Full information, including a program announcement folder, may be obtained from Prof. P. G. Murdoch, Chemical Engineering Department, Texas A & M College, College Station, Tex.

Fort Wayne Group Elects

THE Fort Wayne Rubber & Plastics Group held its fourth meeting in the Hotel Van Orman, Fort Wayne, Ind., on March 27, with 175 members and guests in attendance. The program for the meeting was a panel discussion on "Processing of Plastics by the Use of Dry Blends."

"Trail Blazer" Display

THE organizers of the National Chemical Exposition sponsored by the Chicago Section of the American Chemical Society and scheduled for the Chicago Coliseum, September 9-13, 1952, have set aside a special area in the Coliseum where anyone with an idea which may become the chemical triumph of the next few years may be exhibited. This is the Chemical Trail Blazers' Exhibit, and Herbert F. Schwarz, Sherwin-Williams Co., Roseland Station, Chicago 28, Ill., asks that requests for space be directed to him.

Each exhibitor, individual or group, will be given a four-by-three-foot panel on which to show his idea. No commercial or advertising exhibits will be accepted. Any form of display, from a simple placard to a foot-deep lighted glass case, may be shown. Exhibitors will pay their own shipping costs to and from the Coliseum, but the Exposition will pay handling, mounting, and repacking charges, and the exhibit space will be made available without cost.

The nature of the big Exposition, which brings together 200 or more chemical manufacturing, engineering, and supply groups and many thousands of individual chemists, is an ideal place to display the many ingenious, new, and important chemical ideas in the minds of chemists all over the country, Mr. Schwarz said. He added that he hoped several hundred chemists will come forward with their inventions, discoveries, and suggestions of all sorts.

"Unusual Uses of Rubber"

THE April 25 meeting of the Philadelphia Rubber Group, at the Poor Richard Club, Philadelphia, Pa., attracted 123 members, who heard S. A. Black, of the general laboratories, United States Rubber Co., Passaic, N. J., discuss "Unusual Uses of Rubber."

Dr. Black listed many such items and also commented upon the characteristics of the particular compound which fitted it for each specific use. Included were rubbers compounded for the yielding to physical stress properties, such as a cellular and foam sponge rubber, and those compounded to resist physical and chemical attack, as pipe lining, shipping drums, and fuel cells. Also covered were compounds designed either to conduct or resist electricity. An interesting use of the latter type is as the heating element for radiant heating panels. Rubber in road surfacing and in hydroforming sheet metal also won attention. Dr. Black enhanced his talk with slides showing the various rubbers and their applications.

The meeting concluded with a presentation of the movie, "Neoprene—Versatile Chemical Rubber."

The Group's schedule, according to Chairman T. W. Elkin, calls for a summer outing August 22 at the Cedarbrook Country Club; the fall meeting, November 14, at the Poor Richard Club, when W. J. Sparks and R. M. Thomas will speak on butyl rubber; and the winter meeting, January 23, also at the Poor Richard Club, when Harry K. Fisher will deal with bituminous highway paving.

Acrawax C in Bead Form

THE high melting point (143° C.) synthetic wax, Acrawax C, is now available in a new improved form called Acrawax C Beads, according to Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y.

This new form offers definite advantages in handling and use at no increase in price. The beads are of relatively uniform small particle size which flow readily when poured from the drum. "Fines" have been reduced to a minimum.

Acrawax C is also supplied in solid, powdered, atomized forms and as an aqueous dispersion #S-933. The material is used as a lubricant, release agent, antitack agent, electrical insulant, for moistureproofing, and as an additive for waxes, asphalt, and resins to raise their melting points.

n-Butyl Acrylate Monomer

ANOTHER monomer, n-butyl acrylate, has been added to its list of commercially available monomers by the American Monomer Corp., Leominster, Mass. This monomer is useful in the production of polymers and copolymers for low-temperature rubbers, adhesives, protective coatings, etc. The reactivity of the double bond also makes it a useful intermediate in the production of plasticizers, dyes, etc.

The n-butyl acrylate is a water-white liquid which boils at about 147° C.; it is inhibited with 0.05% hydroquinone.

Guest Speakers at MIT High Polymer Course

FIVE distinguished American and Japanese research scientists will be guest lecturers during the special summer program on the colloid chemistry of Elastic High Polymers in Science and Industry to be held at the Massachusetts Institute of Technology, Cambridge, Mass., from June 16 to July 5.[1]

The guest lecturers are Herman Mark, Polytechnic Institute of Brooklyn, who will talk on "X-Ray Diffraction Studies in High Polymer Chemistry" on June 26; R. P. Dinsmore, Goodyear Tire & Rubber Co., who will lecture on "Modern Tire Construction," on June 30 and July 1; and D. S. le Beau, Midwest Rubber Reclaiming Co., who will discuss "Reclaiming of Natural and Synthetic Rubber," on July 2 and 3.

Harry L. Fisher, Synthetic Rubber Division, Reconstruction Finance Corp., will talk on "Synthetic *vs.* Natural Rubber"; and Shu Kambara, Tokyo Institute of Technology, will discuss "Postwar Developments in the Japanese Rubber Industry" at dates to be announced .

[1]India RUBBER WORLD, Apr., 1952, p. 90.

Drogin Discusses Research

THE April meeting of the Northern California Rubber Group was held April 10 at Angelo's Italian Restaurant, Oakland, Calif., with 40 members and guests present. Speaker was I. Drogin, United Carbon Co., who discussed "Methods Employed in Compounding Research."

Dr. Drogin emphasized that compounding research is no longer considered an art, but is now a science wherein compounds are appraised on the basis of systematically organized facts. New approaches to compounding research include better and more scientific planning of experiments so that the maximum use can be made of the data obtained, the use of mathematical statistics in connection with the physical testing of rubber, and the use of improved equipment and techniques to establish small differences between various rubbers, compounds, etc.

Research compounding may be fundamental in nature and conducted to determine the basic differences between polymers; it may be technological to evaluate the practical possibilities of a rubber; or it may deal with factory processing and fabrication, compounding ingredients, quality considerations, costs, etc.

The practical aspects of compounding research were discussed in connection with tires, mechanical rubber goods, belting, hose, wire and cable, and heels and soles. Emphasis was placed on choice of polymers, compounding ingredients, etc., and also on processing factors, cure, performance, cost considerations, etc.

Dr. Drogin paid tribute to the work of industry compounders in connection with the magnificent gains that have been made by the rubber industry during the past decade.

R. E. Burke, of Burke Rubber Co., San Jose, Calif., gave the group a preview of the plans for the "Second Annual Burke Rubber Co. Summer Outing and Beer Bust."

Dr. Drogin's talk was also given before the Los Angeles Rubber Group at its April meeting.

Cellular Products Program

THE meeting of the Detroit Rubber & Plastics Group, Inc., held at the Detroit Leland Hotel, Detroit, Mich., April 25, consisted of a panel discussion on "Cellular Rubber and Plastics Products." H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., acted as moderator.

The panel was made up of the following persons: C. S. Yoran, Brown Rubber Co.; E. C. Svendsen, United States Rubber Co.; C. L. Collins, Bakelite Division, Union Carbide & Carbon Corp.; R. N. Kennedy, Dow Chemical Co.; R. B. Harper, Virginia Rubatex Corp.; and G. Sprague, Sponge Rubber Products Co.

A transcript of the discussion will be available at a later date for publication in India RUBBER WORLD.

The annual summer outing of the Group will be held at Forest Lake Golf Club on June 27. Walt Bauer is general chairman for the outing, and John Craft will be in charge of the distribution of prizes. A game of softball is planned for the non-golfers.

L. A. Group Golf Outing

THE Los Angeles Rubber Group, Inc., held its first 1952 golf tournament at the Hacienda Country Club, La Habra Heights, March 21. Thirty-five members and guests attended the affair, arranged by Curtis Wolter, Witco Chemical Co., chairman of the golf committee.

The prize for low gross went to Wilbur Johnson, E. I. du Pont de Nemours & Co., Inc., who is also a member of the Hacienda Club and to which some significance might be attached. Low net was won by Gene Huxley, of Western Insulated Wire Co. Bob Maney, Goodyear Tire & Rubber Co., won the prize for the best tee shot, and K. Courtois, United States Rubber Co., the prize for the longest putt. Alex Siamas, Rubber Teck, received the prize for the longest drive, and Jack Martin, a guest, the prize for the fewest number of putts.

The blind bogey prize went to Hal Holmes, Shell Oil Co., a guest, and high gross went to Dick White, Caram Mfg. Co., who was playing golf for the second time in his life.

SPI Standard

(*Continued from page 238*)

industry. The proposed sales note agreement will contain regulations concerning the following legal procedures: passing of title; storage and insurance; terms of collection and credit; cancellations, rejections, and claims; defaults in payment; casualty; compliance with standard; and a section on other contingencies.

The industry may, upon its own initiative, move under the procedures established by the Federal Trade Commission to set up trade practice rules. By using the authority of the FTC, trade practice rules, thus established, have official status. While the establishment of trade practice rules under the FTC does not absolve an industry from legal action, it does minimize the possibility.

(*Concluded on page 264*)

NEWS of the MONTH

Rubber Controls Relaxed April 21; Natural *vs.* Synthetic Rubber Competition to Begin

The National Production Authority, on April 21, revoked its natural rubber specification controls, dropped all specific inventory limitations on natural rubber, GR-S, and butyl, and removed allocation controls over butyl rubber. Higher floors under the consumption of GR-S and butyl rubber and the accumulation of a strategic stockpile of GR-S of 122,000 tons were also ordered. Expansion of petroleum based GR-S facilities may permit a reduction in the price of GR-S by July 1. A reduction in the government's price for natural rubber of 5¢ to 6¢ a pound in June seemed likely.

Several Senators and rubber goods manufacturers asked for public hearings on legislation extending the Rubber Act, following passage of a flat two-year extension by the House of Representatives on March 24. The Senate Armed Services rubber subcommittee headed by Sen. Lyndon Johnson announced on April 25 that such hearings will be held, probably in the middle of this month.

Intensified natural *versus* synthetic rubber competition will begin with the relaxation of the controls on natural rubber consumption, but the American delegation to the May 5, Ottawa, Ont., Canada, meeting of the International Rubber Study Group is expected to call upon the natural rubber producers to improve quality, grading, cleanliness, and packaging of their material, if they wish to regain a major share of the American market.

A survey of rubber industry profits and sales showed 11 major tire and other rubber goods manufacturers to have broken their previous sales records in 1951, but not all companies increased their profits for the past year. First-quarter 1952 profits for United States Rubber Co. were up 4%, but profit declined 30% compared with the 1951 first-quarter figure. The B. F. Goodrich Co. reported first-quarter 1952 sales down 12%, when compared with sales in both the first and the last quarters of 1951.

A long-range study by the Goodrich business research department predicted a considerable increase in tire sales by 1960 over the 1950 period and a similar increase for non-tire products. New rubber consumption in the United States in 1960 was estimated at 1,600,000 tons, as compared with the present 1,250,000 tons.

The biggest problem facing the future operation by private industry of the now large-scale synthetic rubber industry is that of adequate and low-cost raw materials, according to John T. Cox, Jr., who is a consulting chemical engineer in the nation's capital.

The 37-day strike at the Akron plants of the Goodrich company was finally ended on April 3, after nine URWA unionists had been jailed for contempt in connection with an injunction order restricting picketing at the company gates. The union men have appealed the case and are out on bail.

Washington Report

By

ARTHUR J. KRAFT

Rubber Controls Relaxed

Acting on a directive from the Defense Production Administration, NPA revoked its natural rubber specification controls, dropped all specific inventory limitations on natural rubber, GR-S, and butyl, and removed allocations controls over butyl rubber. The sole remaining consumption controls left under the stripped-down Rubber Order M-2 continue to prohibit the use of pale and sole crepe rubber in the manufacture of pneumatic tires, shoes, shoe soles, welting, and wrappers. These types of rubber are still in short supply and are required for the government's strategic stockpile. Manufacturers' inventories on new rubber are now subject only to the "normal working inventory level" restriction of NPA Regulation 1. Retained in M-2 were restrictions on the use of high-tenacity rayon, a limitation on permissible purchases of LTP GR-S from RFC, prohibitions on private importations of natural rubber until July 1, and reporting requirements on consumption and stocks; tire, tube and camelback manufacture; and latex imports. The latex import ban will be revoked when government stocks are liquidated—now expected about May 15.

Two other DPA rubber directives were issued concurrently, both of major importance. The DPA directed NPA to see to it that the annual rate of GR-S consumption does not fall below 450,000 long tons, and that butyl consumption be maintained at least 60,000 tons annually. NPA Administrator Henry Fowler served notice that if voluntary consumption fails to exceed these minimums, the NPA will not hesitate to restore mandatory specification controls. He expressed confidence, however, that industry will continue to maintain its usage above the minimum required levels without compulsion.

The other DPA directive went to the RFC setting forth production levels for GR-S and giving the signal for the accumulation of what amounts to a strategic government stockpile of GR-S. This directive did not stipulate any minimum production figure for butyl, an omission which might be explained as consistent with the Administration's request to Congress for immediate authority to dispose of its butyl facilities. Moreover the DPA does not wish to impose any new impediment to the entry of private capital into the butyl field. Insofar as possible, it would like to see the present impediment —competition with a government produced material—held to a minimum.

RFC was directed to produce GR-S at an annual rate of no less than 600,000 long tons until, in addition to satisfying all other industrial requirements for material, a government owned inventory of at least 75,000 tons of GR-S is accumulated. When this point is reached, the RFC is permitted to cut its output to 450,000 tons annually, provided that while cutting back it also increases its GR-S inventory to at least 122,000 tons.

As of late April, RFC's stocks of GR-S had been built up to around 70,000 tons and should soon be at the first-stage minimum permitting the agency to cut back its output toward the long-range minimum security level of 450,000 tons. The 122,000-ton government-inventory minimum—another bedrock figure for long-range security purposes—is regarded as necessary to tide over the nation in the event that natural rubber supplies are suddenly cut off, necessitating a quick build-up of GR-S output to maximum levels. With post-Korea reactivation experience behind it, RFC should be able to get GR-S production up from a 450,000-ton level to around 800,000 tons within a matter of a few months. In this connection it should be noted that over the past year the agency has modernized its rubber facilities so that few bugs should emerge during any future rapid reactivation period.

The directive to RFC set out only the minimum security levels for GR-S production and stocks. The agency, in April, was producing at an annual rate of about 750,000 tons, and the outlook for industrial demand would seem to point to a continued high-level consumption in the foreseeable future. It may be some time before industrial demand will level off to 600,000 tons a year, or 50,000 tons a month.

RFC has been expanding its capacity for producing petroleum-based GR-S and will continue toward a goal of between 600,000 and 650,000 tons of this type GR-S by the end of 1952. Leland Spencer, Synthetic Rubber Division, RFC, director, told the Senate Small Business rubber subcommittee on March 27 that efficient operation can be maintained if these plants are run at 85% of capacity. Actually, the record shows that operations at 75% of capacity for petroleum GR-S (450,000 out of 600,000 tons) result in per pound costs only a cent or so higher and, therefore, could be considered efficient.

Mr. Spencer also informed the Gillette subcommittee that RFC plans to go ahead with its capacity expansion program, pushing for a capacity of 840,000 tons by July 1, and 860,000 tons by the year's end. As of April 1, GR-S capacity had been lifted to 800,000 tons from last summer's level of 760,000 tons. Mr. Spencer said also that RFC intends to maintain GR-S production at the 750,000-ton level as long as limited warehouse space permits. He said that the space available to RFC was already strained, and that agency has already started to query rubber goods manufacturers to determine the prospects for storing the rubber at their plants. Early indications, however, are that the industry has little warehouse space to make available to the government. RFC probably would turn to commercial warehousing only as a last resort.

Most of the GR-S productive capacity

expansion program will be devoted to boosting output of LTP GR-S based on petroleum butadiene. The planned year-end GR-S capacity of 860,000 tons includes about 600,000 tons or more of petroleum GR-S, and of the latter, about 450,000 tons will be LTP GR-S. As of April 1, GR-S capacity of 800,000 tons included about 550,000 tons of petroleum GR-S, of which 350,000 tons were of the LTP GR-S type.

Current plans call for closing down two alcohol butadiene lines at Louisville, Ky., by May 20, and one line at Kobuta, Pa., by July 1. Thus, of the seven alcohol-butadiene lines available to the program—two of which never were reactivated—only two, both at Kobuta, will be kept in operation after July 1. With continued expansion in petroleum butadiene operations, July 1 should see in active operation enough capacity to produce 700,000 tons of GR-S, of which less than 100,000 tons will be made from alcohol butadiene. GR-S sales ran at about 57,000 tons in each of the two months of March and April. Current high-level RFC stocks should easily absorb any temporary upward deviation in demand.

As the above plans indicate—and as of late April they are still subject to refinement and thus must be considered tentative—RFC will be trimming its sails in the coming few months toward a somewhat smaller, but more efficient and more economical operation. Such action will be reflected in lowered costs to consumers of GR-S. The agency is just now commencing a complete study of the probable operating costs under the trimmed down program and may come up with a lower selling price for GR-S to take effect on July 1.

The present price of 23¢ a pound reflects the higher cost of using alcohol butadiene coming from two units at Louisville and the three at Kobuta, a total of five providing the raw material for the production, at an annual rate of about 200,000 tons of GR-S. Tentative estimates indicate that 1¢ a pound can be knocked off the price of GR-S for each alcohol butadiene line retired from operation. If three lines are shut down by July 1, as presently planned, RFC might be able to reduce its GR-S price to 20¢ a pound.

These estimates are quite unscientific and will yield to the results of the detailed cost studies now under way at RFC. Labor and other operating costs have risen since Korea. These increased costs may have been offset, however, by very favorably priced raw-material contracts which RFC has been rumored to have made in recent weeks. It remains to be seen, also whether RFC will take up the suggestion of the House Armed Services Committee that it give serious thought to setting GR-S selling prices at the higher level which the committee assumes would be needed to reflect the costs that would be met by private manufacturers. Such costs would include capital acquisition from private sources, corporate taxes, advertising, etc.—costs that a government operation does not meet.

RFC Synthetic Rubber Output

The Synthetic Rubber Division, RFC, schedule for April provided for a production of 63,000 long tons of GR-S and 6,950 tons of butyl.

The April schedule called for production of 29,500 tons of LTP GR-S, 10,273 tons of GR-S black masterbatch, 2,901 tons of GR-S oil masterbatch, 2,455 tons of GR-S black oil masterbatch, and 2,880 tons of GR-S latex.

Actual sales in March amounted to 56,681 tons of GR-S and 6,529 tons of butyl. Sales of LTP GR-S totaled 22,873 tons; while GR-S black masterbatch sales were 9,290 tons; GR-S oil masterbatch, 4,270 tons; and GR-S black oil masterbatch 1,504.5 tons. Sales of GR-S latex during the month of March reached the figure of 3,082 tons.

Agency officials estimated that April sales of GR-S would run about 56,000 to 57,000 tons, leaving an excess of about 6,000 tons out of the month's production to be added to government stocks, now reported at about 70,000 tons. Depending on industry response, however, RFC might sell some extra LTP GR-S to manufacturers to built up privately held inventories of this material.

The agency, on April 10 circularized all rubber consumers on whether they would buy more LTP GR-S than permitted for consumption purposes if RFC made it available. M-2 limits monthly purchase of LTP GR-S to 50% of a manufacturer's total GR-S purchases during that month. RFC proposes to allow a manufacturer to push up his LTP GR-S stocks the same 50% ratio through a grant of extra rubber in excess of the quantity which he may buy under the terms of the Rubber Order, M-2.

Butadiene and Other Chemical Expansion

DPA announced April 10 an expansion goal bringing non-government produced butadiene output to 162 million pounds a year by January 1, 1954. The goal, when attained, would bring privately made butadiene production to nearly three times the level which prevailed a year ago, or an increase of 101 million pounds over the January 1, 1951, output.

The agency, in announcing the expansion goal, said it "applies only to that 10% of production by private plants. The capacity of government-owned plants producting butadiene for exclusive use of RFC making GR-S is expressly excluded.

"About 30% of the supply of commercially manufactured butadiene," DPA continued, "is converted into special-purpose nitrile type synthetic rubber, and another 30% is used to make adiponitrile, a basic intermediate for nylon. Other end-uses include the production of high styrene rubbers for shoe soles, floor tiles, and in water paints to replace drying oil varnishes."

The agency said sufficient acceptable tax amortization certificates have been received to bring the production capacity for butadiene up to the expansion goal which has been set.

Earlier DPA had announced a 135-million-pound expansion target for annual domestic production of aniline, to be attained by 1954. This expansion represents an increase of 28.6 million pounds over January, 1951, capacity in privately owned plants. The expansion is needed, the agency said, "principally because of the need for rubber processing chemicals," the demand for which has increased greatly owing to the production and use of a high proportion of synthetic rubber and because of the stockpiling of natural rubber. About 54% of aniline production is used as the basic material for the manufacture of rubber chemicals; while dyestuff manufacture is the second largest user, accounting for 22%.

GR-S Export

The government decided in April to place no limit on total GR-S exports for the second quarter. The action was taken after it became apparent that the export market lacked sufficient dollar exchange to buy all the rubber that the government was able to make available for sale to overseas buyers.

An export quota, amounting to 17,000 tons, had been provided for the first quarter, and while applications for export licenses indicated this would be fully subscribed, only about one-third of the quota had been picked up by exporters at the end of March. The quota—a quantity ceiling limit—was rendered academic.

The free licensing policy adopted for the current quarter had been recommended by the RFC to the interagency export policy committee. The Office of International Trade in mid-March had set a March 31 deadline for filing license applications. Subject to overall export control policy, these applications will be approved without restriction as to quantity.

RFC remains hopeful that the export market for American synthetic rubber will pick up to meet earlier expectations. The agency believes a genuine demand for sizable quantities exists overseas, although its expression through actual purchase orders has been hampered by a lack of available dollars or other hard currency in the countries interested in this material.

That a real demand is latent in foreign markets apparently has been recognized by foreign producers of natural rubber who, at this writing, are expected to make known their opposition to large-scale competition of low-price GR-S in their traditional overseas selling market, when the International Rubber Study Group convenes in Ottawa in May. Producer interests, noting that the export-rubber is being offered at prices reflecting a no-profit government operation, have taken the tack that the U. S. exports constitute a "dumping" operation of excess government production.

Rubber Legislation

Several Senators and rubber goods manufacturers wrote in April to Chairman Richard Russell, of the Senate Armed Services Committee, requesting that it conduct public hearings on legislation extending the Rubber Act, following passage of a flat two-year extension, without prior hearings by the lower house of Congress on March 24.

The House bill, adopted without a dissenting vote, was referred by the Senate Armed Services Committee to its rubber subcommittee headed by Sen. Lyndon B. Johnson.

While House approval was permitted to go through on the unanimous consent calendar (where one "nay" vote can block approval), the final approval was preceded by a half-hour debate, during which Rep. William Ayres, Republican from Akron, O., protested vigorously against the lack of public hearings before the bill reached the floor.

Ayres questioned whether Section 2 of the law—the broad policy guiding the synthetic rubber industry—"has its original forces and meaning." This policy statement, carried over intact from 1948, puts Congress on record in declaring that "the security interests of the United States can and will best be served by the development within the United States of a free, competitive synthetic rubber industry." It

goes on to endorse the termination of government ownership and controls "whenever consistent with national security."

Ayres also said that the three security requirements justifying controls over rubber all have been met. The first requirement is the accumulation of an adequate natural rubber stockpile. The second calls for existence of a "technologically advanced and rapidly expandible rubber-producing industry in the United States." The third is the availability in times of national emergency of adequate supplies of synthetic rubber.

As for the first, he noted that the House committee had acknowledged that the stockpile had attained its "peril point" and was no longer a critical matter.

As for the second, the Akron Congressman noted the rapid expansion attained in the post-Korean reactivation program, the development of a great variety of polymers, and particularly the development of "cold" rubber and oil-extended rubbers.

As for the third requirement, he stated that rubber will be available in surplus quantities this year and that this surplus, coupled with the demonstrated ability to produce one million tons of synthetic rubber this year, satisfies this third security condition.

Extending the present law another two years, he said, amounts to "freezing in a state of suspended animation an industry whose dynamic growth potential is the true key to our national security in rubber."

He questioned whether the House committee was "taking the easy way out" by avoiding the "admittedly difficult problem" of finding a solution to the problems of disposing of the synthetic rubber facilities.

If the security requirements have been met, Ayres declared, the only remaining justification for extending the law another two years "must be" to provide more time for "development of a plan to get the synthetic rubber plants into private hands. And if that is the reason, I must ask: What has happened in the past two years?"

If a plan was developed, he asked, what is it? Were there hearings on it? If no plan was developed, had there been failure to bring the Administration to account for flouting Congressional directives?

"Are we to look forward to an indefinite series of biennial extensions which would cause us to renounce our declared adherence to the principles of free enterprise and our proclaimed intent to divest the government of its synthetic plants at the earliest opportunity?"

Mr. Ayres said he felt a one-year extension would allow sufficient time for the Administration to draw up a detailed disposal plan and Gongress to act upon it. RFC, he said, is pushing forward with the planning of a "realistic disposal blueprint."

"This plan," he said, "should specify what butadiene, styrene, and copolymer plants are to be disposed of, to whom, and for how much. It should detail conditions of contract which would clearly spell out the security obligations of the buyers to maintain inactive facilities in standby and to reactivate them in emergency."

Rep. Carl Vinson of Georgia, chairman of the House Armed Services Committee, said that "we have done remarkably well under government ownership" and expressed his confidence that further progress will be made in the coming two years. But, he said, it would be a "tragic mistake to upset a going operation" as long as "the situation in Southeast Asia, source of 90% of the world's natural rubber supply," remains unresolved.

On April 25, it was announced that the Senate Armed Services rubber subcommittee headed by Sen. Lydon Johnson (D. of Texas) had formed a three-man board to hold public hearings on rubber legislation. The other two members will be Sen. Lester Hunt (D. of Wyo.) and Leverett Saltonstall (R. of Mass.). No date has been set for the hearings but it is expected they will be held in mid-May.

Natural Rubber Price

General Services Administration officials said last month that they plan no change in government selling prices for natural rubber before June 1.

The decision came after several weeks' consideration of making several graduated price reductions running from May 1 through June 30, when the government steps out completely as supplier of natural rubber to the industry.

When the agency announced the 2¢ a pound reduction to 48.5¢ in March, it said this price would prevail for April and May deliveries. Consideration of the alternate course of introducing another cut for May deliveries came after this announcement. It was considered and then rejected.

While there is no guarantee that the present price of 48.5¢ a pound will be further reduced in June, such a reduction generally is expected, because of the sharp drop in world market prices which began during February. The reduced market prices may permit GSA to lower its resale price about 5¢ or 6¢ a pound for deliveries in June, when it should have full arrival of rubber bought overseas in late February and March.

In fixing its resale price, GSA adds 4¢ for delivery and handling to the price at which it buys the rubber overseas. Taking the average monthly Singapore market price and tacking on 4¢, GSA came up with these "cost" figures for some past months: July, 1951 — 51.18¢; August — 52.05¢; September — 56.22¢; October — 55.20¢; November — 52.18¢; December — 50.44¢; January — 50.11¢; February — 43.58¢.

Administrator Jess Larson told Congress in late March that most of the rubber GSA would sell in April had been bought in January and earlier, a lag of three months and more between purchase abroad and sale in this country.

January's purchases, as the above prices indicate, were resold in April at a loss of about 1.5¢ a pound. The agency's policy is to sustain a no profit, no loss position, but evidently GSA has fallen a little behind on keeping in the black. Mr. Larson told this reporter late in March that GSA probably would end up its buying and resale operation on June 30 with a small net loss. All this would indicate that the next price reduction by GSA, reflecting the lower costs of February acquisitions, should be deferred at least until late May.

GSA gave hard thought to the alternate course of making a small reduction for May deliveries and following this with another cut for June—a two-step rather than a single-step reduction, both in the end adding up to the same total dollar-wise. This course was considered because it seemed to commend itself as a useful mechanism for ameliorating inventory losses which would be sustained by manufacturers, once cheaper rubber becomes available for consumption through private imports after June 30. It would have permitted manufacturers to spread inventory losses over an additional month.

The Office of Price Stabilization is believed to be giving serious consideration to removing price controls from natural rubber after transactions in the commodity are restored to a private-market basis on July 1.

Late in April the entire question of what type, if any, control regulation should be written to cover natural rubber trading was still under very preliminary consideration. Nothing concrete has developed since OPS Rubber Branch officials met with the agency's crude rubber industry advisory committee on March 18—the first and only meeting to date.

Throughout the period of exclusive government buying OPS has maintained formal, if academic, control over the prices at which natural rubber has been sold in this country. This control consists of approving GSA price schedules prior to any changes in those prices. GSA was required, under an agreement with OPS, to submit its proposed price changes 15 days prior to their effective date. As far as is known, OPS always approved GSA recommendations.

As for the price control pattern to be imposed when private transactions are once again supreme, OPS has said only that it will take no action before consulting its advisory committee, which is evenly divided between producers and traders. No such meeting has been announced as yet.

Rather than trying to develop a detailed, complex regulatory control over crude natural rubber, the agency may allow prices to take their normal course, but with the understanding that should the market reach a predetermined figure, controls will be imposed. This policy, in effect, announces to the rubber trade that a maximum permitted price is in reserve, to be put into effect when and if an unregulated market should breach whatever level OPS determines is the upward limit to uninflationary prices.

Natural *vs.* Synthetic Rubber Competition

The government's action on April 21, revoking restriction on the consumption of natural rubber, is expected to touch off a vigorous effort by the world's natural rubber producers to regain a major share of the American market. The enormous demands of the U. S. stockpiling program have been largely filled, and the natural rubber producers can no longer depend on this program to take up vast quantities of their rubber.

Although rid of restrictions on the commercial market in the United States, the producers have new problems in that prices and quality will now be major factors in determining manufacturers' preferences among various types of rubber. Stockpile procurement will be conducted on a more businesslike and slower-paced basis, with emphasis also on picking up higher grades at reasonable prices. GSA head, Jess Larson, told this reporter in late March that the era in which that agency keyed its program to leading the market down has ended. Stockpile procurement, to the limited extent possible, will be used to keep the market on a steady keel. Stockpile buying will be pinpointed to keep the market from falling too sharply. Mr. Larson said it would be "disastrous to let the rubber market fall too sharply" since it would lead to "further chaos" in the rubber producing area. He was careful to note, however, that whatever GSA does must come within the limits imposed by the existing stock-

pile target and the availability of stockpile funds.

The last available estimates indicate that the United States will have available to it this year about 700,000 tons of natural rubber. Producers may be expected to try to expand their commercial sales to about that total, which represents the difference between the estimated U. S. industrial demand for between 1,200,000 and 1,300,000 tons of new rubber and the new annual minimum synthetic rubber consumption minimum of 510,000 tons.

Leland Spencer in testifying before the Gillette rubber subcommittee of the Senate Small Business Committee, March 27, said that our current usage of about 450,000 tons of natural rubber could be lowered somewhat in event of emergency, but is probably the lowest we could go without instituting harsh direct controls on tire users. He said that this country could not become entirely free of a need of natural rubber in the foreseeable future.

It would appear, therefore, that the area of competition between natural and synthetic rubber ranges somewhere between 200,000 and 300,000 tons a year, after allowing for government-directed floors on synthetic rubber consumption and a hard core of several hundred thousand tons which has been conceded to natural rubber on purely technological grounds.

Aside from price questions and the possibilities of further technical improvements in synthetic rubbers, the rubber producing industry will be called upon to improve the quality, grading, cleanliness, and packaging of its material in any effort to take the measure of synthetic rubber in the American market. Demands for marketing improvement have long been sounded by the rubber products manufacturers and are slated to be pressed hard at the Ottawa meeting of the International Rubber Study Group, beginning May 5.

The American delegation at Ottawa hopes to impress upon the natural rubber producing industry that conditions have changed and that any rubber at a price is no longer acceptable. The wild, upward spurt in the market which followed the Korean outbreak, manufacturers say, impressed upon them the necessity of maintaining a ready, alternate source of supply —in other words, a high production and consumption of synthetic rubber. Research leading to improved synthetic rubbers gained a tremendous impetus from the demands of the post-Korea reactivation program and is not likely to be allowed to lapse, if for no other reason than that long-term demands for rubber are likely within a decade to outstrip any prospective increase in production of natural rubber.

The natural rubber industry over the past few months had its first real taste of consumer insistence on strict marketing standards when GSA applied the rejection and penalty clauses to off-grade and non-bona fide shipments set forth in GSA contracts. Despite the vehement protests levelled by producer interests at this "arbitrary" action, GSA acted after a year of hectic purchasing activity which, in addition to bringing it large quantities of rubber, also brought it far too large a proportion of off-grade and non bona-fide rubber. The former, it is said, amounted to about 40% of all rubber bought by GSA, while the latter amounted to over 10%. The GSA purchase contract rejection, arbitration, and penalty clauses were adopted from the model contract drawn up by The Rubber Manufacturers Association, Inc. There is little reason to believe that manufacturers will soft-pedal the use of these clauses in the future.

Small manufacturers, particularly those lacking a diversified group of products, must have delivery of the particular grades suited to their product. They can use off-grades only within very narrow limits. Larger, diversified manufacturers have been able to absorb off-grade shipments to a much greater extent, but this ability to absorb has diminished owing to the trend toward carrying smaller inventories of natural rubber at factories.

The lines of the contest between natural and synthetic rubber for the American market were summed up in a statement by W. J. Sears, RMA vice president, on the occasion of the revocation of rubber controls on April 21. Mr. Sears said:

"From now on, natural and synthetic rubbers will compete in an unregulated market. The decision lies with industry rather than government, and such factors as quality, cleanliness, uniformity, and cost figure freely in the choice of raw materials . . . .

"From now on, natural rubber will find American made synthetic rubber a stiff competitor. Synthetic rubber accounts for 65% of our current rubber consumption in the United States, and all rubber products are of satisfactory quality. Quality of both the raw materials and end-products is vastly improved. The cleanliness, uniformity, and packaging are vastly superior to natural rubber and are factors which make it particularly attractive to the manufacturer.

"The future success of natural rubber as a competitor rests on the ability of producers to develop a clean, uniform product, properly graded and packaged. Improvements in that direction are long overdue."

The Natural Rubber Bureau through its publication, *Natural Rubber News*, in the April, 1952, issue, also takes cognizance of the change in the natural rubber problem when it states that the swing is from a market dominated by consumption controls to one dominated by straight competition, with consumers deciding the proportion of natural and synthetic rubber they want on the sound basis of relative quality at relative price.

"The natural rubber producing industry is always ready to accept the verdict of the consumer on this point and asks only for an unrestricted opportunity to compete," it was said. "It does believe, however, that it should be competing against an industry whose costs are determined on a competitive basis and which has to pay taxes and assume the normal production and sales costs which would be involved in a private enterprise and not a cartelized industry."

Natural Rubber News for April also carries some interesting figures on the production of natural rubber by grades, obtained as a result of a study of the subject by the editors of that publication. The figures based on 1951 production follow:

1951 Natural Rubber Production by Grades

	Tons
Ribbed smoked sheets	1,220,000*
Pale crepes	75,000
Blankets (Ambers) and Browns	330,000
Flat bark	45,000
Smoked blankets	40,000
Others (Africans and South Americans)	65,000
Liquid latex	90,000
Total	1,865,000

*Includes approximately 610,000 tons of #1 RSS.

—A.J.K.

Other Industry News

Industry Sales, Profits

Akron Beacon Journal in its issue of March 24 presented a survey and analysis of the 11 major tire producers' sales and profits for the year 1951, which is found in the accompanying table. All of the 11 companies, including the six Akron companies, broke their own sales records in 1951. Their gains ranged from 14% for Seiberling Rubber to 81% for Mohawk Rubber. Firestone's 41% increase topped the larger firms. Largest increase achieved by any firm except Mohawk was Dayton Rubber. Tenth in sales in 1950, Dayton moved into seventh place in 1951 by passing Lee Rubber, Armstrong, and Seiberling.

Seven of the companies showed higher profits than in the year previous; while four companies, General, Mansfield, Lee, and Seiberling, did not despite increased sales. These four companies attributed the drop in earnings to such factors as higher rubber costs, restricted production, and much greater tax burden.

Armstrong Rubber made the best earning record of all companies, 5.6% of sales. Goodrich again topped the major companies with a profit of 5.4% for every dollar of sales, although its earnings were up only 0.1% over 1950 figures. Mohawk with the biggest profit increase, 80%, earned 5.1% of sales.

H. E. Humphreys, Jr., chairman of the board, U. S. Rubber, at the company's annual meeting of stockholders in Passaic, N. J., April 15, reported that sales in the first three months of 1952 totaled approximately $220 million, an increase of about 4% over those in the first quarter of 1951, but profit declined from $9,077,000, or $4.41 a common share, to an estimated $6,225,000 or $2.80 a common share, a drop of 30%.

He attributed the decrease in profit largely to higher costs for raw materials, higher wages, a larger amount of low-profit defense business, and increased taxes. He said that in the first quarter of both years the company was at the ceiling on combined federal income and excess profits taxes, with the ceiling 68% of profit in 1951 and 70% in 1952.

Rubber Industry Sales, Profits

	$ 1951 Sales	% Gain over 1950	$ 1951 Profits	% Gain or Loss to '50	Ratio Profits to Sales	$ Earnings per Share
Goodyear	1,101,141,392	30	36,628,000	4	3.3	8.18
Firestone	975,766,455	41	48,398,950	45	4.9	12.26
U. S. Rubber	837,222,092	20	30,366,449	23	3.5	14.29
Goodrich	637,722,241	17	34,742,881	.1	5.4	8.15
General	170,771,521	36	7,790,467	—9	4.5	12.48
Mansfield	63,431,000	34	2,290,000	—11	3.6	12.50
Dayton	54,602,904	47	2,380,938	—6	4.4	5.01
Lee Rubber	50,402,406	28	2,185,632	—26	4.3	8.62
Armstrong	50,325,336	21	2,832,393	22	5.6	7.28
Seiberling	43,681,425	14	1,216,574	—33	2.8	3.30
Mohawk	20,884,078	81	1,072,312	80	5.1	7.57

Mr. Humphreys said he expects sales for the rest of the year to remain near the current level. He saw little likelihood of a return of scare buying and warned that competition is growing stiffer. He said profit should continue around the first-quarter rate, and that profit for the year could be as good as in 1950, the company's best year except for 1951. Although he did not forecast dividends, he pointed out that for some time it had been the policy of the directors to pay out roughly one-half of the earnings on the common stock.

Humphreys said the raw material shortages which handicapped operations last year are no longer a problem. Except for limitations on the use of natural rubber, practically all rubber controls have been relaxed. [Natural rubber use limitations were almost entirely removed on April 21. EDITOR.]

He predicted a further decline in natural rubber prices when the government steps down as sole buyer on July 1 and turns the function over to private industry. He pointed out that the government's current price for #1 RSS is 48½¢ a pound; whereas currently quoted prices for July delivery in the free market are around 36½¢.

The U. S. Rubber executive also voiced disapproval of the bill recently passed by the House of Representatives extending government ownership of the synthetic plants for two more years. He expressed hope that the Senate will take different action.

"We believe that a one-year extension is sufficient and that, during that one year, plans can and should be worked out for private companies to take over the synthetic rubber plants," he said.

John L. Collyer, Goodrich president and chairman of the board, told stockholders of that company at the annual meeting in New York, N. Y., also on April 15, that sales of Goodrich for the first quarter of 1952, both in dollar and physical volume, were down about 12%, as compared with sales in the first quarter of 1951 and also with sales in the last quarter of 1951.

He pointed out that in appraising the sales outlook for the full year 1952 it should be noted that for the first time since Korea sales are following the normal season pattern. The first quarter of last year was substantially above normal because of a wave of scare buying following the invasion of Korea by the Chinese, he said. He reported also that the 1952 first-quarter sales were adversely affected by a strike of six weeks' duration in Goodrich plants in Akron.

Collyer also predicted that the rubber manufacturing industry should have another high-volume year as estimated consumption of new rubber in the United States for 1952 is about 1,250,000 long tons, compared with 1,214,000 tons in 1951. Of the U. S. total in 1952, about 63% will be American made synthetic rubbers, approximately the same percentage as in 1951.

He said that unless the world political situation or conditions in the Far Eastern rubber producing areas worsen materially, supplies of rubber should be ample throughout 1952.

With regard to extension of the Rubber Act of 1948, Collyer said that the House of Representatives had recommended another two-year extension, but that it was his company's position that "the Act should not be extended for more than a one-year term."

"We strongly believe," he declared, "that out national security interests will best be served by the development within this country of a privately owned, competitive, man-made rubber producing industry. The sooner this is accomplished, the better it will be for the American taxpayer and the rubber consumer, and for our military security."

"Trends and Prospects—1950-1960"

A booklet, "Trends and Prospects in the Automotive, Rubber, and Allied Industries—1950-1960," prepared by Goodrich's business research department, based on studies by leading economists and the Goodrich company, contains some extremely interesting information. Prepared in February, 1952 it is emphasized that it is a projection of *long-term* trends only. Estimates are also drawn on the assumption that the United States will not be engaged in an allout war in the next decade.

The basic factors considered in this projection are: (1) the population—the total number of people who will *consume* goods and services; (2) the age distribution of the population—particularly the number of people able to *produce* goods and services; (3) the number of hours worked by the people who *do* the work; (4) the output per worker per hour. The specific effect of the projected estimates of the above factors on the automotive, petroleum, tire, and other rubber products industries is then considered.

A population increase from 150 million in 1950 to somewhat less than 175,000 in 1960 is predicted. A growth in the age group between 18 and 59 years from 85,600,000 in 1950 to 90,500,000 in 1960 is indicated, with a working force increase from 60,000,000 to 63,300,000 for the same periods. The number of hours worked in 1950 is given at about 41, with the 1960 figure dropping to somewhat less than 40.

In terms of real gross national product produced per worker per manhour, an increase from $1.19 in 1950 to $1.51 in 1960 is predicted based on "the American genius for designing tools and methods to get things done better and faster."

It is calculated that passenger-car registrations will increase from 40 million in 1950 to about 54 million in 1960, and to permit this increase passenger-car production is expected to average 5,070,000 units for the 1951 to 1960 period, as compared with 4,280,000 units during the 1946 to 1950 period. Similar increases for trucks, buses, and wheel tractors are also estimated.

Original equipment tires and other rubber products should average much higher than in any past period because (1) of the increase in the production of vehicles and (2) because of the increase in the pounds of rubber per vehicle used, it is said.

It is further figured that the average passenger car in the replacement market—those more than two years of age—will be driven 25% more miles per year in 1960 than at present.

Replacement passenger-car tire shipments between 1950 and 1960 were estimated on the basis that there will be no change in tire serviceability and also if tire serviceability is improved by 25% in this period. On the second basis, replacement passenger-car tire sales of 66 million units in 1960 are to be expected, but if the 25% improvement in tire life is not accomplished, the 1960 tire sales may be expected to exceed 66 million units.

The outlook for truck tire and for tractor-implement tire replacement sales is also very promising, it was said. The total demand for tires and for all of the many other rubber products used on motor vehicles will exceed—substantially—the present capacity of the rubber industry, the report added.

The volume of the other rubber products not used on vehicles which account for about 25% of the rubber consumed in this country has been increasing even more rapidly in recent years than that of the products for vehicles, and the trend should continue. The increase in population, in the younger and older age groups, and the movement to suburban areas should result in an increasing demand for consumer rubber products, such as footwear, heels and soles, garden hose and drug sundries, it was pointed out.

New rubber consumption in 1960 was estimated at 1,600,000 tons, compared with 1,250,000 tons used in 1950.

Although great opportunities are ahead, they will not be realized automatically, it is said. A large amount of capital will be needed—capital which must come from the savings of business and individuals, and we must have an economic climate which will make such savings possible and which will make them available to business.

Also, economic growth can be hindered—can even be stopped—by politics. Bureaucratic interference and tampering with the integrity of the dollar will hurt—not help. It is suggested that the people of the country fight against unnecessary government spending and support measures designed to balance the federal budget.

Finally, statesmanship of a high order will be needed to prevent an allout war, which would destroy the possibility of attaining the higher standard of living possible if the anticipated improvements in our economic situation could be realized.

Synthetic Rubber Outlook

John T. Cox, Jr., consulting chemical engineer, Washington, D. C., writing in the *Natural Rubber News* for April, 1952, on "The Synthetic Rubber Outlook," mentions that the Synthetic Rubber Division, RFC, in an effort to reduce the number of polymers produced by that organization, has announced a policy effective July 1, 1952, in which after that date a new system of polymer numbering will be effective, and some single polymers may encompass the properties found in three or four previous ones. Furthermore, substantial changes in polymerization techniques will be effected that will standardize practice on a large segment of the production. This policy has been announced so that sufficient time may be granted users to adjust their formulations to these new conditions. Some excerpts from the policy are stated as follows:

1. All regular GR-S will contain 23.5% bound styrene, and all LTP GR-S will contain 20% bound styrene.

2. All regular GR-S will be polymerized in an activated recipe.

3. Carbamate will be the shortstop used for all reactions, regular or low temperature.

4. In emulsifying LTP GR-S there will be three types of emulsification: 100% rosin acid, 50/50 rosin/fatty acid, and 100% fatty acid.

5. RFC will continue to issue "X" numbers for experimental polymers. After issuance, an "X" number may continue in production for a maximum of six months. At the conclusion of this period it will be discontinued, or a regular number assigned.

Dr. Cox listed a table of actual and

estimated production for the various synthetic rubbers for 1952. Totals were: GR-S, 756,618 tons; GR-I (butyl), 85,-965; nitrile types, 16,362; and neoprene, 146,766,780 pounds.

In commenting on the direct economics of many factors surrounding the synthetic rubber industry in the United States and its possible return to private hands in two years or less, it was pointed out that the raw material supply situation for GR-S for private industry operation was exceedingly complicated and poorly defined. Petroleum butadiene, if purchased for GR-S, costs between 9¢ and 10¢ a pound, while alcohol butadiene costs between 42 and 50¢ a pound, at present. Styrene costs the government approximately 5¢ to 6¢ a pound less than the present market price of 21¢ a pound. It is very unlikely that the privately operated industry could hope to obtain such prices, which in reality are out-of-pocket costs, ex amortization, insurance, profit, taxes, etc., Dr. Cox points out.

Alcohol butadiene will not be a competing factor so long as it follows its usual price pattern. The raw material for petroleum butadiene has become an integrated, and increasingly so, part of the burgeoning petrochemical industry, and it will never be of the price range with which it began its entrance into the synthetic rubber industry, it was said. A price of 18 to 20¢ a pound for petroleum butadiene seems more likely for private industry operation of synthetic rubber plants, and if a stable price of alcohol could be achieved somewhere between 20 and 25¢ a gallon, it would become a factor in this picture at this level, it was added.

Styrene presents less of a problem because of lower usage in the polymer formulations, but again, the principle raw material for styrene, benzene, has more than doubled its price in the past two years.

Raw materials for the synthetic rubber industry are a major problem confronting private operation of this large-scale industry, and further information on this subject is promised by Dr. Cox for some time in the near future.

Labor News

On April 1, in Akron, nearly 20,000 rubber workers were idle in three plants in connection with strikes and work stoppages of various kinds. About 12,000 employes were away from their jobs at the Goodrich plant as a result of the strike of office workers earlier in March, which finally stopped all production. More than 4,000 were out at the Goodyear Tire & Rubber Co.'s Plant 1 because of a calender room dispute, and at least 2,500 were idle at Firestone Tire & Rubber Co.'s Plant 1 because of a controversy over allowance pay.

Akron Common Pleas Court Judge Bernard J. Roetzel, on March 28, found George R. Bass, president of the local URWA union, and eight other unionists guilty of contempt of an injunction order restricting picketing during the office workers' strike at Goodrich. The judge sentenced all the unionists to serve 10 days in jail and fined each $250. All were freed on $200 bond each pending appeal to a higher court.

All production at the Goodrich plant was shut down as production workers left their jobs after the court announced its decision on Bass and the other unionists.

The following day, March 29, Judge Roetzel ruled that the local URWA union was not guilty of the same contempt charges on which he had sentenced the nine unionists. The judge said the evidence created a reasonable doubt as to the guilt of the union.

Company and union negotiators came to terms on April 3 to end the 37-day strike, and the local URWA union ratified the agreement on April 4. Under terms of the settlement the company agreed to: (1) grant the union a modified union shop contract if it wins the National Labor Relations Board election to determine if the local URWA union is to be the sole bargaining agent for the office workers; (2) provide the union with salary, promotion, and other data concerning salaried employes in the bargaining unit, if the union wins the election; (3) permit the strikers to return to their jobs without discrimination.

The union, in turn, agreed that it would: (1) call off the strike; (2) withdraw its unfair labor practice charges against the Goodrich company; (3) consent to an election under the supervision of the NLRB to determine if Local 5, URWA, is to continue as the sole bargaining agent for 1,100 office employes.

The NLRB election was scheduled for April 30 at the Goodrich plants in Akron.

Production was resumed at the Goodrich plants on April 7.

In mid-April, a wildcat strike at the plant of Mohawk Rubber Co. in Akron closed that plant. The workers refused to return to their jobs as requested by their local URWA union president. The trouble developed when powerhouse employes quit work when the company discharged a fireman for neglect of duty.

Safety Awards

The 1951 award winners for the Rubber Section, National Safety Council, safety contest have been announced with the issuance of the final bulletin from the NSC. During 1951 the contestants in the Rubber Section contest operated 404,716,000 man-hours and during that time experienced 2,305 injuries. Compared with the final figures for the 1950 contest, these figures represent an increase in the exposure and injuries of 27 and 31%, respectively.

The final average cumulative rate for all contestants was slightly higher than the final rate for the preceding contest. This is the second consecutive year that the rate has increased. The increase in rate, however, was due to adverse experience of new contestants. The Rubber Section states that it hopes the participation of the new contesants in the contest has proved beneficial and that next year their rates will decrease.

The Rubber Section safety contest is divided into divisions depending on the average monthly man-hours exposure of the companies in the contest as follows: Division 1—over 400,000; Division 2—200,000 to 400,00; Division 3—100,000-200,000; Division 4—50,000-100,000; Division 5—under 50,000.

Final standings and frequency rates of the winning contestants for the various divisions were as follows:

Division 1. First place, Firestone Tire & Rubber Co. of Calif., 0.62 rate. Second place, United States Rubber Co., Mishawaka, Ind., 0.79 rate. Third place, Goodyear Tire & Rubber Co., England, 1.04 rate.

Division 2. First place, Dryden Rubber Co., division of Sheller Corp., Chicago, 0.00 rate. Second place, B. F. Goodrich Co., Akron, O., Plant #4, 0.41 rate. Third place, Goodrich, Akron aeronautical division, 1.07 rate.

Division 3. First place, Goodrich, Tuscaloosa, Ala., 0.00 rate. Second place, Firestone, Xylos plant, Akron, 0.52 rate. Third place, U. S. Rubber, Milan, Tenn., 0.57 rate.

Division 4. First place, B. F. Goodrich Chemical Co., Port Neches, Tex., 0.00 rate; Firestone, Lake Charles, La., 0.00 rate; Goodrich, Cadillac, Mich., 0.00 rate; General Tire & Rubber Co., Baytown, Tex., 0.00 rate; and Goodyear Tire & Rubber Co. of Canada, Ltd., Quebec, P.Q., 0.00 rate.

Division 5. First place, Firestone Plastics Co., Pottstown, Pa., 0.00 rate; University of Akron, Akron, 0.00 rate; Goodrich, DuBois, Pa., 0.00 rate; Firestone, Xylos plant, Memphis, Tenn., 0.00 rate; Flintkote Co., Whippany, N. J., 0.00 rate; U. S. Rubber Reclaiming Co., Cheektowaga, N. Y., 0.00 rate; Canadian Lastex, Ltd., Montreal, P.Q., 0.00 rate; Flintkote Co. of Canada, Ltd., New Toronto, Ont., 0.00 rate; Ohio Rubber Co., Plant #2, Conneautville, Pa., 0.00 rate; U. S. Rubber, Burlington, N. C., 0.00 rate; and, Lodi Mfg. Co., Middlesboro, Mass., 0.00 rate.

The information in the bulletin from which the above information was obtained was prepared by the statistical division, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

United Stockholders Meet

At the annual meeting of the stockholders of United Engineering & Foundry Co., Pittsburgh, Pa., April 22, stockholders approved an increase in the authorized $5 par common capital stock of the company from 1,000,000 to 5,000,000 shares. Appropriate amendments to the articles of incorporation and the by-laws were also approved as recommended by the company management.

The board at a special meeting April 29 acted upon the plan of increased capitalization by authorizing a common stock split up in the form of a stock dividend. Common stockholders as of record May 9 will receive on May 20 two additional shares of $5 par common stock for each share held as of the record date. The total par value of the additional stock issued will be transferred to capital from surplus account.

The present 832,236 outstanding shares of $5 par common stock will as a result of this distribution be increased 2,496,-708 shares.

Five directors elected included K. C. Gardner, Sr., K. C. Gardner, Jr., G. G. Beard, H. M. Naugle, and William K. Frank. The present officers of the company were reelected by the board.

Owing to the recent death of F. C. Biggert, Jr., chairman, President K. C. Gardner, acting as ex-officio chairman, presided at the meeting. Mr. Gardner stated that in line with the financial results of business generally in 1951, United's sales were the highest of record, but because of increasing costs and higher taxes, net income was substantially reduced from that of preceding years. The backlog, he stated, would require capacity operations through several years and the company's output and defense efforts would be limited only to the physical capacity of men, material, and machinery.

EAST

General Tire Washington Exhibit

General Tire & Rubber Co., Akron, O., through most of April, took over the Federal Room of Washington's Hotel Statler, with a display exhibit describing the company's operations and products. The exhibit was well attended by industry and government personnel as well as the general public. Overlooking the main stairway from the lobby was a giant model of a rocket, the product of the company's Aerojet Engineering Co. General Tire introduced the exhibit with a special showing for the press on April 2 and subsequently held several receptions for other interested groups, including a cocktail hour and dinner for government officials on April 15.

The exposition displayed in the Federal Room covered 2,400 square feet, telling the company's story with a series of 17 displays and more than 100 color photographs. The visitor entering the room immediately came into the focus of a television camera and found his visage projected on a television screen. The television camera-and-screen setup served as an introduction to the first display, highlighted by a large map of the United States dotted with electrically lit towers, each representing a station affiliated with the Mutual Network. General Tire has a major interest in Mutual through its ownership of the Yankee Network, Station WOR in Newark, and the Don Lee Network on the West Coast.

The next display booth described General Tires nationwide distributorships, emphasizing that distributors of the company's products are independent businessmen, not employes of General Tire & Rubber Co.

"General Tire around the World" was the title introducing the next display, which consisted chiefly of photographs of General's manufacturing plants in Canada, Portugal, Mexico, South Africa, Chile, Venezuela, and Israel. The company's practice in its foreign operations is to retain minority interests so that local capital "can make a substantial profit," General officials explained.

The fourth display booth was devoted to the work of Aerojet Engineering, showing a model of the Jato rocket for planes and noting this division's major contribution to the defense program. In addition to Jatos, Aerojet makes liquid propellant rockets for turbojet engines and has also contributed to rocket and guided missile development.

Polygen — the company's oil-extended synthetic rubber—was the main attraction of a centrally placed exhibit, describing this product. Large blocks of various types of raw rubber were on display, along with fabricated pieces made of Polygen. The company, through a recorded talk broadcast at this part of the display room, expounded the many advantages, both economic and technical, of the use of Polygen for wide-scale use.

Highlighting the next display booth was a motion picture, on miniature screen, with sound-track, demonstrating the inner working of a tire production plant. The film started with delivery of crude rubber to the factory and carried through to the final processing into a complete tire.

Two other booths demonstrated the production of black-masterbatch synthetic rubber and the compounding of Polygen.

The remaining booths, given over to describing the company's manufacturing operations, consisted primarily of a display of various products, including tires of all sizes, a number of mechanical goods, and athletic balls, from the well-known Pennsyvania brand tennis ball to the more recently introduced rubber volleyball, football, and basketball.

The products of the Kolcast division, making "Tools and Machines for Defense," were found in still another booth. On display were metal parts produced by the mercury casting method which is capable, the company said, of turning out intricate shapes of any alloy that melts.

Also on view were the products of the company's chemical division, consisting chiefly of chemicals used in making rubber and plastics products. The final booth, leading the visitor to a wall panel display of photographs of the principal executives of the company, was a panoramic model of Aldora, Ga., the "modern village" wholly owned by General Tire and the center of the company's fabric production facilities.

Personnel Mention

Wm. O'Neil, president of General Tire, on April 16 was reelected to the board of Brand Names Foundation, Inc.

Thomas F. O'Neil, vice president of General Tire and president of Thomas S. Lee Enterprises, Inc., parent company of the Yankee and Don Lee networks, WOR radio, and WOR-TV, and the Mutual Broadcasting System, announced last month that Harry Wismer, radio and television sports commentator and executive, has been retained in a general executive capacity. Mr. Wismer will be active in the new and expanded programming of the O'Neil radio and television stations. He has already started a new series of five-times-weekly broadcasts over WOR, under the sponsorship of The General Tire & Rubber Co. Mr. Wismer will also be featured on WOR-TV and will continue his broadcasting of major sports events.

Late in the month Mr. O'Neil was elected president, effective May 31, of Mutual Network, of which he is also chairman of the board.

Delivering Titanium Slag

New Jersey Zinc Co., 160 Front St., New York 38, N. Y., in its March, 1952, issue of the *Horse Head Bulletin* mentions that large plant test lots of titanium slag now are being delivered to customers from the Quebec Iron & Titanium Corp., jointly owned subsidiary of Kennecott Copper Corp. and N. J. Zinc, as the result of more than three years of intensive work. The inaccessibility of this deposit of ilmenite—the largest known in the world—required major construction to bring the ore to the St. Lawrence River. More than 400,000 tons have already been shipped to a new treatment plant, about 50 miles east of Montreal at Sorel, where ample electricity is available for smelting. The five furnaces will treat 1,500 tons of ore a day and will produce pig iron for sale to Canadian steel producers, and titanium slag, destined for full-scale plant tests by numerous companies in the United States interested in the production of titanium dioxide.

Test Laboratory for Stock Cutting

Taylor, Stiles & Co. has set up a completely equipped testing laboratory at its Riegelsville, N. J., plant to which anyone may bring or send sample materials for test cutting to any specified dimensions or fineness.

It would be expensive, if not impossible, to make some of these tests elsewhere, as they require the use of machines of various types, found only at the factory that supplies cutters of the latest types to many industries.

No charge is made for experimental cutting in this laboratory unless the volume amounts to a production quantity. Any charge is then for actual cost of handling only.

Ross & Roberts in Merger

The calendered and extruded vinyl plastic film and sheeting manufacturing business heretofore transacted by Ross & Roberts, Inc., at Stratford and West Haven, Conn., is now known as Ross & Roberts Co., a division of Pollak Industrial Corp.

This change reflects a merger of already existing interests between Henry Pollak, Inc., and Ross & Roberts, Inc., to facilitate further expansion. Pollak has for years been a leading firm in distributing and importing of millinery supplies.

Arthur M. Ross and Alvin V. Roberts remain in complete charge of the business of Ross & Roberts, as heretofore, and also become officers and directors of the merged corporation. Ross & Roberts Sales Co., Inc., continues as exclusive sales and technical field representative for Ross & Roberts.

Executives Advanced

Pittsburgh Plate Glass Co., Pittsburgh, Pa., has appointed G. Donald Campbell as superintendent and John A. McMillan as plant engineer for its Shelbyville, Ind., manufacturing plant.

Conversion of the recently purchased plant to fiber glass production will soon be under way, according to the firm. Two types of fiber glass, strand fiber and superfine fiber, will be manufactured when production commences later this year.

Mr. Campbell has been with the company since 1930, first as a chemist at the Henryetta, Okla., window glass plant and later as a research engineer at the Creighton, Pa., laboratories. Prior to his new appointment, he was assistant superintendent at the Clarksburg, W. Va., window glass plant.

Mr. McMillan has served during the past five years as plant engineer for Duplate Canada, Ltd. Previous associations were with Research Enterprises, Ltd., as chief mechanical engineeer, and with the National Research Council as a research engineer.

Assocation of National Advertisers, Inc., 285 Madison Ave., New York 17, N. Y., has added to its headquarters staff John M. Royal, formerly with the advertising department of Dow Chemical Co., and John K. Lee, formerly advertising production manager of Gates Rubber Co.

Changes at Smith Chemical

Smith Chemical & Color Co., 55 John St., Brooklyn 1, N. Y., has named Eugene Z. Smith to head its export department, and Howard Greenwald to head the special materials department, which deals with customers' special requirements and technical problems.

Mr. Smith's two years' experience was gained partly in the laboratories of one of New York's major paint manufacturers. Mr. Greenwald has spent ten years in the business.

Janon's Silver Jubilee

Samuel G. Janon, manager of the Smith company, recently was honored on the occasion of his twenty-fifth anniversary with the firm. President Casper Smith presented Mr. Janon with an inscribed gold wrist watch. His wife also received one. The New York Paint, Varnish & Lacquer Association at its March meeting awarded Janon its Paint Pioneer Certificate for 25 years' service, which began after his graduation from Pratt Institute, where he majored in chemistry, and has seen him advance through all the departments in the Smith company as it enjoyed extensive growth during more than three decades of service to many industries, as importer, exporter, and manufacturer of chemicals, colors, and pigment fillers.

Vulcan 6 — Furnace Black

Godfrey L. Cabot, Inc., Boston, Mass., has announced the development of a new superior grade of rubber reinforcing oil furnace black called Vulcan 6. The use of this new black in tire treads is said to result in an increase in mileage of between 15-25%, compared with that obtained when standard grades of HAF black are used. The greatly increased reinforcing ability of Vulcan 6 has been proved in extensive Cabot road tests. The fact that the new black can be substituted directly in HAF formulations will be significant in its general acceptance by the trade, it was said.

The properties of Vulcan 6 recommend it for use wherever high tensile and high abrasion resistance are of primary importance. Rubber goods manufacturers can now obtain superior reinforcement that far exceeds that provided by HAF blacks, without having to make major changes in HAF formulations, according to the Cabot statement.

Vulcan 6 marks a new step forward in the development of highly reinforcing furnace blacks. The introduction of HAF blacks to the rubber industry resulted in the production of tires and other products that were of higher quality than those made with the conventional channel blacks. Vulcan 6 now makes it possible to extend even further the service life of carbon reinforced rubber products, it was added.

Cabot Wollastonite Mining Activity

Godfrey L. Cabot, Inc., through Cabot Minerals, a division of Cabot Carbon Co., a subsidiary of the parent firm, has entered into the quarrying and grinding of wollastonite, a calcium metasilicate, at Willsboro, N. Y. Wollastonite is recommended for use in paints, dielectric ceramics, floor and wall tile, welding rod coatings, alloying agents, and soil conditioners.

The new Cabot Minerals division project, when completed, will represent an investment of $2 million, and production will be approximately 60,000 tons annually. Reserves are conservatively estimated at 15 million tons. The extensive research and development organization of the Cabot company have been devoted to an intensive study of the physical and chemical properties of various types and grades of wollastonite products for the past year or more.

Wollastonite is a pure white, natural mineral of nearly theoretical purity and remarkable physical and chemical uniformity. Its most outstanding properties are its brilliant whiteness, its uniformity, and its fiberous nature. In special fiber grinds the fiber length may be 13 to 15 times the diameter. By varying grinding methods, it may also be reduced to very short fiber particles. Wollastonite is unique in that it is the only white, wholly fiberous mineral in the mineral filler price range.

When in full production, the Willsboro plant will employ 75 to 100 persons. Arthur L. Hall, production manager, is in charge of all quarrying and manufacturing operations. F. Scott Carpenter directs market development and sales activities; while Raymond B. Ladoo is general consultant, and Payson E. Hatch production consultant.

New Portable Barge

A new-type portable barge, made of rubberized fabric, has been developed by Seiberling Rubber Co., Akron, O., for the U. S. Army. The barge, made of three sausage-shaped tubes which support an aluminum deck, is 36 feet long and 12 feet wide, but can be rolled into a package three feet high and ten feet long, which can be transported by plane. In addition, two or more barges can be lashed together to form a quickly assembled dock.

Seiberling said that the Army Transportation Corps is testing the new barge at Fort Eustis, Va. The inland water barge is capable of carrying 16 tons of machinery, trucks, or other heavy cargo. The new barge was developed by Seiberling's new product department to meet general specifications outlined by the Army. An improved method of vulcanizing large rubber boats and floats, which cut production time of large floats from one every 24 hours to one every 45 minutes, was developed by Seiberling during World War II and for which the Army-Navy "E" was awarded to the company.

More Liberal Warranties

Seiberling has also announced new warranties, permitting its independent dealers to handle adjustment claims on truck tires as well as passenger-car tires "on the spot." The warranty on premium Safe-Aire passenger-car tires, furthermore has been made more liberal.

These warranties guarantee the tires free from defects in materials and workmanship, regardless of mileage or length of service, and permit any Seiberling dealer to make immediate adjustments on them.

Replacement due to unrepairable damage from use is guaranteed at no cost to the customer for the first 30% of tread wear. After 30%, adjustment is based on percentage of wear.

Seiberling's truck tire warranty protects the customer's investment against defects and also against complete loss due to unrepairable fabric breaks during the first 25% of tread wear.

Directors Reelected

All directors of Seiberling Rubber Co. were reelected April 14 at the annual meeting of the company's stockholders, as follows: J. P. Seiberling, president and chairman of the board; Robert Guinther, company counsel; A. C. Blinn; T. Tyler Sweeny; H. P. Schrank, R. J. Thomas, L. M. Seiberling, and C. E. Jones, Seiberling vice presidents; and Willard P. Seiberling, company secretary.

Oxidation of Oleic Acid

Emery Industries, Inc., Cincinnati, O., recently received government permission to start construction on its new $2-million plant for the oxidation of oleic acid by ozonization. With this announcement, Emery Industries disclosed the results of an extensive research program during which its chemists and engineers cooperated with the Welsbach Corp., Philadelphia, Pa., to reduce to practice, the first large-scale use of ozone in a chemical process industry.

Production from this new plant will increase manifold Emery's present output of azelaic and pelargonic acids, the two products which result for the oxidation of oleic acid, of which Emery is now the sole producer. Output from the new plant may be expected within less than a year, certainly by the middle of 1953.

The use of azelaic acid in the production of alkyd resins as well as in the manufacture of plasticizers for the vinyls, cellulosics, and synthetic rubbers can be expected to expand as costs come down. Only the limited availability and relatively high price has restricted expansion in fields where it will be possible to obtain excellent low-temperature performances of many of the esters of azelaic acid even in relatively low-cost plastic materials.

Moves Executive Offices

Thomas Robins, Jr., president of Hewitt-Robins, Inc., has announced a realinement of administrative responsibilities, concurrent with the establishment of the company's executive offices at Stamford, Conn.

Benjamin T. Moffatt, a vice president of the company for 11 years, has been elected executive vice president, with three divisional general managers responsible to him for their respective operations.

Harold Von Thaden continues as a vice president, an office he has held since 1945, and becomes general manager of the international division, in addition to the Robins Engineers Division, which he has headed for several years.

Austin Goodyear, formerly assistant general manager of the Hewitt Rubber and Robins Conveyors divisions, was appointed general manager of both divisions.

Robert A. Nilsen was made general manager of the Restfoam Division.

Continuing in previously held positions will be: L. D. Bigelow, vice president, central sales division; J. H. Hayden, vice president, western sales division; Ellis B. Gardner, controller; W. H. Watkins treasurer; G. F. Goodyear, secretary; R. L. Schieffelin, assistant secretary and assistant treasurer, all of whom, except Bigelow and Hayden, will make their headquarters at Stamford.

B & S Reorganizes Division

The reorganization of Bagley & Sewall's slitter and rewinder division, involving thorough and complete coordination of engineering, manufacturing, service, and sales has been announced by W. A. Zonner, executive vice president. By closing the New York office and concentrating all operations and functions under one roof at the enlarged and modernized plant and executive headquarters in Watertown, N. Y., the company will be in a better position to service its customers.

Bagley & Sewall has been manufacturing slitters and rewinders for several decades, and in the last few years several new models have been added which embody many unique and important features to insure greater speed, accuracy, and economy of operation. According to Mr. Zonner, Bagley & Sewall will continue the manufacture of all established models, and the company's extensive spare parts inventory will make possible rendering fast and efficient service to customers.

Changes at Kleinert

Richard M. Bleier was elected a director of I. B. Kleinert Rubber Co. 485 Fifth Ave., New York 17, N. Y., at the annual meeting of the stockholders last month. Mr. Bleier is assistant to the president, Ralph K. Guinzburg, and prior to coming to the New York office had been plant engineer at the College Point, L. I., factory for four years. Mr. Bleier was graduated from Cornell University in 1935 with a degree in administrative and mechanical engineering and was with the American Machine & Foundry Co. until he joined an anti-aircraft unit at the beginning of World War II.

Horace Wilcox, formerly sales manager of Kleinert's retired May 1 after 58 years with the firm. Mr. Wilcox for many years was a Kleinert salesman calling on accounts all over the country and at various times also covered Australia, New Zealand, and South Africa. He served as Kleinert sales manager for many years. Since his retirement from that position he was in charge of merchandise for sale to jobbers and special events for stores.

Du Pont Sesquicentennial

The one hundred and fiftieth anniversary of the establishment of E. I. du Pont de Nemours & Co., Inc., will be marked July 18 at the site of the first du Pont powder mills on the banks of Brandywine Creek a few miles from Wilmington, Del. The ceremonies will include a simple historical dramatic prologue, addresses by company officials, and the dedication of a marker on the site of the first plant.

About 6,000 spectators—representatives from the 71 plants and Wilmington offices, retired employes, members of the du Pont family, and guests—will be on hand for the program, which will be broadcast over a national network.

The story of du Pont's growth will be told in a book, "Du Pont—The Autobiography of an American Enterprise," to be published about the first of July. The theme of the volume is the parallel development of the company and the nation over a century and a half.

John F. Allen

Allen, Schreurs with IOI

Appointment of John F. Allen as manager of the Allen extrusion machinery division of Industrial Ovens, Inc., 13825 Triskett Rd., Cleveland 11, O., was made April 5 by C. A. Litzler, IOI president. Allen heads a complete new plastic and rubber insulation machine subdivision of the company.

Allen has had 30 years of extensive design and engineering sales experience in the rubber and plastics extrusion field. In 1916, Allen joined his father, Edward E. Allen, originator of the Rapido-Tuber, as a part-time development and design engineer. When that company merged with National Erie in 1928, Allen assumed the position of sales engineer of original installations. His association with National Erie continued up to the time of appointment at Industrial Ovens.

Merle F. Schreurs has been named manager of the new coating research and development laboratory at Industrial Ovens. He was formerly project engineer for the vinyl dispersion division of the research and development laboratory of Texileather, Toledo, O., which he had joined in 1948 to develop the coating processing lines and formulate processing compounds. During the last ten years Schreurs has had extensive experience in formulation and fabrication-processing of rubber, tire fabrics, and mechanical rubber goods. He has also done extensive research in low-pressure laminates and the injection molding and extrusion of thermoset and thermoplastic materials. This work also includes research in the field of coating with plastisols, organosols, hydrosols, silicones, and rubber latices. Schreurs was graduated with a degree in chemical engineering from Iowa State College, where he specialized in chemical formulization of plastics.

Industrial Ovens, designs, manufactures, and installs continuous materials handling and processing systems—generally requiring the engineered application of heat—for the rubber, plastics, paper, textile, film, and wire industries.

Airtite Rubber Corp., manufacturer of all types of vacuum hose, 953 E. 51st St., Brooklyn 3, N. Y., has moved to 655 Main St., Westbury, N. Y.

Thourlby, McNeil Advanced

W. H. Thourlby has been promoted from manager of customer relations to manager of the Detroit sales division of The Standard Products Co., 2130 W. 110th St., Cleveland 2, O.

Gordon McNeil has been advanced to sales manager of the company's mechanical rubber division at Port Clinton, O.

Mr. Thourlby joined Standard Products in 1939 as its Washington representative. He also served as an executive in military production works at the Port Clinton and Cleveland divisions before joining the Detroit sales office in 1945. He represented the company with automotive accounts before becoming manager of customer relations last year.

Mr. McNeil joined Standard Products in 1950. He was chairman of the Ordnance Tank Track Engineering Committee during World War II and has been chief engineer for the large tank track program under way at Standard Products. He also served for 23 years in the Goodyear manufacturing sales department.

Expanding Operations

Smith Kirkpatrick & Co., Inc., 65 Broadway, New York, N. Y., has acquired controlling interest in Dussi-Wallace & Co., Inc., 60 E. 42nd St., New York 17. Smith Kirkpatrick has been conducting a general importing and exporting business for more than 70 years, but up to the present has not dealt in plastics raw materials.

Dussi-Wallace was formed in September, 1946, to specialize in the foreign sale of plastics raw materials. Products handled include injection, compression, extrusion, and calendering compounds and plasticizers as well as sheets, rods, films, and tubes. Although the bulk of these products is prepared by well-known manufacturers, the sales of these items are in general under a uniform "D-W" label.

With the new arrangement it is planned to expand substantially the operations of Dussi-Wallace by utilizing increased financing and other facilities.

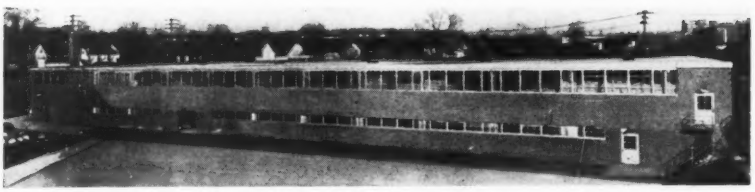
Present officers of the D-W company follow: president, Russell A. Wallace; vice president, H. M. Sweeney; treasurer, C. A. Hohloch; secretary and sales manager, Ernest Hofeller.

New Officers at Carbide

Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y., last month announced the following executive changes.

Morse G. Dial has been elected president of the corporation, to succeed Fred H. Haggerson, who continues as chairman of the board. Mr. Dial, elected executive vice president in 1951, had joined the corporation in 1929 and served successively as assistant secretary and assistant treasurer (1939), secretary-treasurer (1945), vice president and director (1949), and a member of the executive committee (1951).

Kenneth H. Hannan has been elected treasurer of Union Carbide. He started in the law department of the corporation in 1936, then served in the U. S. Navy from 1941 through 1945. Returning to the finance department of Union Carbide, Mr. Hannan became secretary and assistant treasurer in 1949.



West Side of New Harwick Building Viewed from Tank Farm

Harwick Open House

At an Open House celebration on April 5, Harwick Standard Chemical Co., Akron, O., presented its plant to the public for inspection. Rebuilt after the disastrous fire on the night of May 1, 1951, the new building provides many additional features including a complete product control laboratory, a tank farm with 60,000-gallon storage capacity, and more warehouse space. More than a thousand representatives of rubber plastics, chemical, and other firms attended the reopening celebration.

In reviewing the reconstruction program, Jack R. Moore, president of Harwick Standard, said: "We faced a 75% destruction of our plant 11 months ago with a loss of hundreds of tons of chemicals and considerable heat and water damage to our general offices. Despite the difficulties in procuring some critical building materials, we have moved ahead on our plans with only a slight delay in our original schedule. Office procedures were functioning again on May 2, 1951, within a few hours after the fire, and our production processes were going ahead again within three weeks. Now with reconstruction completed we have greater facilities for serving, more warehouse capacity, and more efficient equipment for handling materials."

Founded in 1932 by the late Curtis J. Harwick, Harwick Standard Chemical Co. now represents a number of major manufacturers of chemicals and processing materials and serves the rubber, plastics, chemical, paint, paper, and ceramics industries in a technical and supply capacity.

The new Harwick plant was rebuilt at a cost of approximately $300,000 and now gives the company two full floors for its own warehousing and administrative activities.

Purchases Plastics Plant

United States Rubber Co., Rockefeller Center, New York 20, N. Y., has purchased from Milprint Inc., Milwaukee, Wis., its plant in Stoughton, Wis. The purchase includes land, buildings, and equipment. The Stoughton plant, built by Milprint in 1947 for the manufacture of plain and printed vinyl films, has a floor space of 39,000 feet and employs about 100 people. The rubber company will use the plant for the production of new products, principally lightweight, unsupported, and supported plastic films.

Expanding Passaic Factory

An additional 60,000 square feet of manufacturing space will be constructed at U. S. Rubber's plant at Passaic, N. J., according to William C. Bowker, plant manager. Construction will start as soon as possible and will be finished in six months.

The new area will house facilities for the manufacture of hose for the Armed Forces. The company's investment in the new facilities is expected to provide jobs for an estimated 125 persons.

The new area will be contained in an additional floor to be constructed on the company's three-story building on Market St. and a four-story 100- by 100-foot extension to the same building.

Votes Common Stock Split

The board of directors on April 16 voted a 50% distribution of the company's common stock out of share capital after giving effect to the 2-for-1 split voted by the stockholders at their annual meeting April 15. The distribution is to be made May 15 to stockholders of record April 23. This action, coupled with the 2-for-1 split, will have the effect of splitting the company's common stock three shares for one.

Changes at Naugatuck Chemical

Naugatuck Chemical Division last month announced several changes among its personnel. Gerald L. Dennis has been appointed branch manager of the West Coast operations of the division. Mr. Dennis, formerly technical sales representative for rubber latex and dispersions in the Philadelphia area, replaces J. Raymond Morath, who died earlier this year. Mr. Dennis will make his headquarters in the division's newly completed West Coast plant and branch office in Los Angeles, Calif. He joined Naugatuck Chemical in 1944 at the Kankakee Ordnance Works, Joliet, Ill., transferred to the development department in Naugatuck, Conn., in 1945, and entered the sales department in 1946, covering first the New York and then the Philadelphia territories.

D. Leete Keefer replaces Mr. Dennis in Philadelphia.

William J. Curtin, assistant to the sales manager, was appointed technical representative in the Naugatuck area, succeeding Mr. Keefer. The former will make his headquarters in the division's main offices in Naugatuck.

New assistant to the sales manager is Lawrence H. Bruce, formerly a process engineer in the Naugatuck Chemical plant at Naugatuck, Conn.

Six organizational changes in the development department of the division also were announced last month as follows: Vadim C. Neklutin, assistant manager of process development; Robert M. Greene, group leader of Paracril and synthetic latex development in the process development section; Robert L. Knapp, group leader of Vibrin and Kralac development in the process development section; Wm. F. Brucksch, Jr., senior group leader for physical chemical research; E. Leonard Borg, senior group leader for applied and development research in synthetic rubber; John A. Flickinger, group leader for dispersions and Sealz development.

G-E Appointments

General Electric Co., Schenectady, N. Y., last month announced the following changes among its personnel.

Three new appointments have been made at the chemical division's silicone plant at Waterford, N. Y. Jerome T. Coe has been named manager of sales development; Robert Treat, Jr., supervisor of customer service; and John F. Bahm, supervisor of sales administration and control.

Mr. Coe started with the company in the research laboratory at Schenectady and from 1943-46 served in the U. S. Navy. On returning to G-E he was employed in the chemical engineering division and in 1948 was named in charge of process engineering at the Waterford plant.

Mr. Treat first was employed by the Goodyear Tire & Rubber Co. as a technical superintendent and then joined G-E in 1944 as a research assistant in the research laboratory. Two years later he was assigned to pilot-plant work on silicones; in 1947, he was named a technical supervisor at the Waterford plant; a year later was promoted to general foreman; and in October, 1950, he was named supervisor of product services.

Mr. Bahm joined the company in 1946 on the production training course in plastics. The next year he was assigned to materials specification; in 1948, started on the sales training program at Waterford; in 1949, became a sales representative for silicone products in the Cleveland area; in 1950 returned to Waterford to enter the sales development section; and in March, 1951, was transferred to sales planning and analysis.

Phenolics in Wide Use

The chemical division also reports that its G-E 12487 rubber-phenolic molding compound is being used by Plastics Molding Corp. for encasing a copper bus bar weighing 14 ounces with a $\frac{1}{8}$-inch thickness of insulation by the transfer molding process. Because of the high resilience of the compound, there is no cracking of the molded part despite the differences in coefficient of expansion of the two materials.

The company also points out that the resiliency and high impact resistance of G-E rubber phenolic compounds are also being used to advantage in other insert applications—press fitting and riveting. The strength of G-E rubber phenolics is said to be five to seven times that of conventional phenolics.

Marbon Corp. has completed a new 23,000-square-foot warehouse at Plant II in Gary, Ind. This new warehouse has both track spur and highway facilities. Marbon Corp., manufacturer of high-styrene resins, rubber-to-metal adhesives, paint chips and resins, is a subsidiary of Borg-Warner.

Tyer Rubber Co., Andover, Mass., has advanced Emmett Lamb, sales representative in New York State for 19 years, to sales supervisor in the state. His former post goes to Charles S. Stone, who headed the products scheduling department at Andover. Except for service in the Navy, from 1942 to 1945, Stone's entire business career has been with the Tyer footwear division.

Rub-A-Mix Developments

The Goodyear Tire & Rubber Co., Akron, O., and Berry Asphalt Co. have joined forces to develop further Goodyear's rubberized surfaces for playgrounds and other recreational areas. Berry Asphalt has been given distribution rights on Goodyear's pelletized rubbers.

In addition to projecting the rubber playground program, both companies are engaged in the development of synthetic rubber powders for use in asphalt mixes for highway construction. Goodyear's pelletized rubber, being marketed as Rub-A-Mix, is well suited not only for playgrounds, but as a surfacing material for walks, bridge floors, railroad crossings, and other installations requiring a resilient, noiseless, waterproof, and flexible surface.

Opens New Warehouse

Expanding operations by Goodyear have necessitated the opening of a new factory field warehouse at Sandusky, O. The structure contains 94,000 square feet of floor space and will be used to store tires, tubes, and other products. Approximately 50 people will be employed.

Manager of the warehouse for Goodyear is P. R. Breese.

Sandusky is in the company's Cleveland sales district.

Personnel Promoted

Kay B. Sebert has been named chief chemist at Goodyear's Java plant. Sebert, a member of the mechanical goods compound development department since 1950, recently completed a 90-day training course and left last month for his new assignment. Sebert joined Goodyear as a member of the Akron training squadron in June, 1947, and later served in the tire compound development department.

Allen E. Polson has been named to the newly created position of manager of sales service in the chemical division. Polson joined Goodyear in 1948 as a special representative in Akron and early the following year became a technical representative of the chemical division. A 1942 graduate of the University of Minnesota with a degree in chemical engineering, Polson did postgraduate study in patent law at Columbia University. He was employed by E. I. du Pont de Nemours & Co., Inc., as a research engineer, technical investigator, and patent agent from 1942 to 1948, except for the period July, 1944, to December, 1945, when he served with the U. S. Army in the Office of Strategic Services.

Furthering its expanding program to improve customer relations, the chemical division assigned Phillip S. Sherman the responsibility for expediting customer service in processing and shipping orders. Sherman will continue to headquarter in Akron, where he has been employed throughout his civilian business career. He was engaged as adviser of men and instructor of economics at his Alma Mater, the University of Akron, from 1936 to 1941, when he entered the Army Air Force. Emerging from service, Sherman returned to Akron U. in 1946 as assistant dean of students. He vacated that post in 1950 to join the Goodyear squadron. Early in 1951 he was assigned as a special representative in the chemical division, where his work included sales promotion and writing technical literature.

George M. Sprowls, manager of the highway transportation department at Goodyear, spoke on "Rubber and Factors Affecting Tire Mileage," at a meeting of motor vehicle committees of the American Gas Association and Edison Electric Institute, held at the Benjamin Franklin Hotel, Philadelphia, Pa., April 9.

New Rubber Tester

Firestone Tire & Rubber Co., Akron, O., has developed a new machine, the rubber deterioration tester, that, it is said, immediately reveals contamination and deterioration in natural rubber and has presented the machine to the General Services Administration for use in connection with its purchase of natural rubber for stockpiling and for industry use. The new machine is portable and can be used by an inspector on the docks when the rubber is received.

The rubber deterioration tester employs infrared light rays which penetrate the rubber at temperatures up to 280° F. and when excessive copper and manganese are present, the rubber test sample breaks down and gives evidence of liquefication within 10 minutes. A sample of good rubber will resist breakdown for longer periods of time.

Campbell Steel Products President

L. J. Campbell has been appointed president of Firestone Steel Products Co., subsidiary of Firestone and one of the world's largest manufacturers of truck and tractor rims and producers of stainless steel beverage containers until steel for them was diverted to defense products. The subsidiary operates two factories, one in Akron and one in Wyanotte, Mich.

Mr. Campbell was vice president of the Steel Products since 1950. Previously he had served as its comptroller, from 1944 to 1950, comptroller of Firestone Aircraft Co., and treasurer of the G & A Aircraft subsidiary of Firestone. He has been with the Firestone organization since 1942.

New York Quartermaster Procurement Ageny, 111 E. 16th St., New York 3, N. Y., recently announced the awarding of the following contracts for: *natural rubber bands,* 227,000 boxes, (¼-pound each) at $40,292.50 to Wayne Rubber Co., Hollis, N. Y.; *men's overshoes,* 28,008 pairs, $104,749.92, to Goodyear Rubber Co., Middletown, Conn.

Cyanamid Assignments

Robert P. Parker has been named director of chemical research, Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J., to succeed H. Z. Lecher, who retired April 1. Dr. Parker came to Calco as a student trainee, joined the research department in 1934, became a group leader in 1938, sectional director in the organic research section in 1944, assistant to the director of research in 1946, and assistant director of research of the pharmaceutical section in 1947.

He is succeeded in that capacity by J. J. Denton, who joined Calco in 1941 in the organic research section. In 1943 he was transferred to the pharmaceutical research section and was appointed a group leader in 1945 and a sectional director in 1950.

J. M. McNamee has been appointed sales representative for the industrial chemicals division in the Georgia and Florida district, with headquarters in Atlanta, for American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

Joining Cyanamid in 1950 at the Stamford Research Laboratories, Mr. McNamee was later transferred to the New York office as a technical representative for the synthetic organic chemicals department.

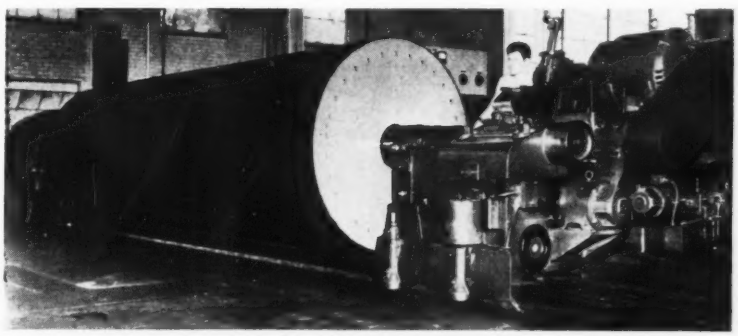
Huge Roll Grinder

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., recently installed a huge precision roll grinding machine, said to be the largest in the rubber industry, at its roll covering plant at North Charleston, S. C. After installation, the machine was used for grinding a rubber covered roll having a 240-inch face and a 60½-inch finished diameter. Designed to meet the expanding needs of the paper industry, the grinder is 35 feet long between centers and will grind rolls from 10-62 inches in diameter and from 50 inches to 35 feet long.

Burrows and McHugh in New Posts

Harold H. Burrows has been made sales manager of the industrial rubber goods sales division at Raybestos-Manhattan. After serving for several years as assistant manager of the roll and tank departments, Mr. Burrows became manager of those departments in 1942.

Charles P. McHugh has been appointed manager of the roll covering and tank lining production departments of Manhattan Rubber Division at Passaic.



Huge Grinder Used by Manhattan Rubber for Grinding 60½- by 240-inch Rubber Covered Roll

Changes at Goodrich

Several changes in western district managership of the replacement tire division, The B. F. Goodrich Co., Akron, O., took place recently.

W. S. Seliger is now Los Angeles district manager. For the past three years he had been general supervisor, a post now held by Ralph Earnest, former district truck tire representative.

C. E. Newman, Salt Lake City district manager, has been made manager of the Seattle district. At Salt Lake City, J. Wells Martin becomes general supervisor and acting district manager. He has been with the company 18 years and was formerly district area manager.

O. K. Lynn, Seattle district manager, replaces W. R. Dakan as manager of the San Francisco district. Dakan will be assigned other responsibilities with the company after a short leave of absence.

American Anode a Division Now

American Anode, Inc., formerly a wholly owned subsidiary of the Goodrich company, was liquidated after the close of business on March 31. Effective April 1, the business will be conducted under the name of: "American Anode, a Division of The B. F. Goodrich Co."

There are no changes in personnel at Anode. R. V. Yohe continues as president and general manager; and R. R. Jennings, as treasurer.

Scott and Page Promoted

John C. Scott, Jr., and George H. Page have been advanced to account executive positions in the Detroit sales office of The Standard Products Co., Cleveland, O. They will serve under Sales Manager Howard Thourlby in a general strengthening of the sales divison.

James M. Henry succeeds Mr. Scott as general manager of the company's Gaylord (Mich.) division. Mr. Page was sales manager of the contact division in Cleveland.

Mr. Scott joined Standard Products 17 years ago at Port Clinton, O., and has served as an executive in manufacturing, accounting, personnel, and sales activities.

Mr. Page came to Standard Products in 1950 after serving as vice president of Coleman-Pettersen Co., of which he is still a director. He has had a major part in obtaining many major military contracts for Standard Products.

Mr. Henry joined the company in 1944 after having been assistant to the president of a life insurance company in Toronto. He has been head of Standard's planning department, assistant to the general manager of the Port Clinton division, and assistant to the sales manager.

Anniversary Tire Sale

Celebrating its thirtieth year in business, Sieberling Rubber Co., Akron, O., in cooperation with independent dealers has announced a special "4 for 3" sale on Safety passenger tires. The company's independent dealers throughout the country are selling the premium-quality tires in sets of four at the price of three from May 10 through July 4.

Emery Sales Meeting

Among the announcements at the annual meeting of the chemical sales staff of Emery Industries, Inc., held at Cincinnati the week of April 7, was the program of territorial expansion now under way to insure better service to users of Emery fatty acids, Twitchell products, and plasticizers.

A. R. McDermott, from the Chicago district office, will assume the responsibility for all sales in Texas, Louisiana, Oklahoma, and Arkansas.

N. F. Reinert, with the development and Service department, has been assigned to the Chicago office to work under D. R. Eagleson, in charge there.

An addition to Emery's sales staff, F. L. Ekstrand will be assigned to the Philadelphia office and will cover eastern Pennsylvania, southern New Jersey, and parts of Philadelphia. Mr. Ekstrand was with Borne Scrymser Co. in a sales capacity since 1939.

The general theme of the Emery sales meeting was "Better Service to Fatty Acid Users." This was highlighted by panel discussion in which salesmen exchanged information, ideas, and experiences pertaining to both successful and unsuccessful sales experiences and product applications. Each discussion was supplemented with samples of the products involved.

Several new products were released from the development and service department to become important new sales products. Full details concerning these will be released soon.

The meeting concluded with a golf tournament in which home-office executives competed unsuccessfully against sales personnel. J. Clancy walked off with the honors.

Fidelity Machine Co., Inc., 3908 Frankford Ave., Philadelphia 24, Pa., has completed an agreement with H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles, Calif., whereby the latter becomes exclusive sales representative in the State of California for Fidelity equipment for the wire and rubber industries, including vertical hose reinforcement machines, automatic rubber measuring and cutting machines, and automatic electronic rubber take-up reel stands.

Charles T. Wilson Co., Inc., 120 Wall St., New York 5, N. Y., distributor of crude and synthetic rubber and latices, has announced that, effective May 1, its sales representative for the Pacific Coast area is R. D. Abbott Co., 5107 Anaheim Telegraph Rd., Los Angeles 22, Calif. Wilson was formerly represented by Reinke & Amende, Inc., Los Angeles, who has discontinued operations in the rubber field.

V. M. Brediger, president of The Chardon Rubber Co., Chardon, O., at a recent directors' special meeting was elected also chairman of the board to succeed the late R. H. Bostwick.

Spadone-Hoag Corp., 10 E. 43rd St., New York, N. Y., manufacturer of Metaline oiless bronze bearings, has changed its name to Spadone-Alfa Corp., with offices at the same address.

WEST

Dow in Japan

An agreement for the formation of a company to manufacture plastic materials in Japan was announced recently by Clayton S. Shoemaker, president of Dow Chemical International, Ltd., a subsidiary of The Dow Chemical Co., Midland, Mich.

The new corporation, to be known as Asahi-Dow, Ltd., will be an associated company of Dow International and The Asahi Chemical Industry Co., Ltd., of Osaka and Tokyo. Each of the firms will hold a 50% stock interest in the new company and will be equally represented on the board of directors. Shoemaker said the agreement is now awaiting approval by the United States Bureau of Internal Revenue and Japan's Foreign Investment Commission.

Initial plans call for the construction of facilities for the production of saran monomers and copolymers at Nobeoka, on the island of Kyushu, but Shoemaker said Asahi-Dow expected also to manufacture saran filaments and might later engage in other lines of production.

Asahi Chemical is one of the largest chemical companies in Japan, manufacturing a general line of basic chemicals and is particularly prominent in the production of rayon.

To Increase Hose Output

In a move to meet the increased demand for Voit flexible automotive hose, the W. J. Voit Rubber Corp., Los Angeles, Calif., has engineered and installed a new production line and plant capable of manufacturing twice the previous output, according to Willard D. Voit, corporation president.

Consisting mainly of batteries of hose building and cording machines, the new plant includes and provides for a series of inspection steps which assure a high standard of workmanship throughout the entire hose manufacturing operation.

The production line will produce four basic and a like amount of special diameters of hose which, combined with varying lengths, will provide, roughly, 36 different hose sizes. Eighteen of the sizes are designed for the popular Voit replacement hose kit which eliminates the 164 pieces previously necessary to service completely all makes of passenger automobiles. Eighteen other sizes, in addition to the custom-built hose for highly specialized racing cars, are produced for original equipment installation in trucks, stationary auxiliary power plants, and the like.

Union Rubber Co. recently held Open House at its new facilities at 1002 77th Ave., Oakland, Calif. More than 600 guests attended.

Martin & Stockton Co., Woodruff Crossing Rd., Downey, Calif., is the name of a new business enterprise for trimming all kinds of molded goods. L. Martin, formerly of S. & G. Rubber Co., and H. Stockton, formerly of Kirkhill, Inc., are the organizers of the company.

3M Appointments

Appointment of three general managers to head tape divisions of Minnesota Mining & Mfg. Co., St. Paul, Minn., was announced April 8, as follows: C. C. Smith, head of the cellophane tape division; Wm. E. Zimmerman, general manager of the industrial tapes division; Bernard W. Lueck, general manager of the masking tapes division.

The company's other tape unit, the electrical and sound recording tape division, will continue to be headed by Robert L. Westbee.

Smith went to work in 3M's order department in 1928; in 1936 became eastern sales manager for cellophane tape; in 1941 was made sales manager for cellophane tape and in 1949, general sales manager of the tape division.

Zimmerman began as a salesman in 1938 and served successively as Buffalo division sales manager for cellophane tape products (1944); head of tape sales to industrial trades (1948); and sales manager for general-line tapes (1950).

Lueck joined 3M as assistant to the advertising manager in 1935, he became a sales engineer in 1936, product manager for paper tapes and sandblast stencil in 1946, and merchandising manager of the paper tape division in 1948.

Alan H. Redpath has been advanced to the newly created position of merchandising manager of all 3M tape products; while R. S. Frommer has been made manager of the tape group's central sales inventory and production planning department.

Redpath, merchandising manager for cellophane tape and ribbons since 1949, joined 3M as a clerk in 1931, moved into the general sales office in 1933, was named a department head within the tape sales organization in 1940, and assumed charge of cellophane tape merchandising in 1947.

Frommer started with 3M in 1937, as a technician in the abrasive division; in 1940-41 did time-study work designing production incentive plans for employes; in 1942 moved back to St. Paul to the abrasives planning department; and in 1948 became responsible for organizing and managing the tape inventory control department.

Charles W. Walton has been made general manager of the adhesives and coatings division, to succeed Louis F. Weyand, now executive vice president in charge of all 3M tape operations. Walton joined the company in 1947 as assistant to the executive vice president in charge of manufacturing and in 1948 organized and became general manager of the new products division. He started his career in 1933 with Goodyear Rubber Co. and was assigned to synthetic rubber research. During World War II he headed a technical coordinating group within Goodyear to facilitate the flow of information on synthetic rubber problems among government agencies and other cooperating companies.

Authur S. La Pine & Co. has opened its new plant at 6001 S. Knox Ave., Chicago 29, Ill. This new 37,000 square-foot modern plant contains a large laboratory with ample facilities for customer's use for testing and inspection of new equipment and a complete machine shop for manufacture and repair of scientific equipment it also has a large air-conditioned office.

Names Ultron Distributer

Monsanto Chemical Co., St. Louis, Mo., has appointed Goss Coated Fabrics Corp., Los Angeles, Calif., West Coast distributor of Ultron vinyl film. R. C. Evans, assistant general sales manager of the plastics division at Springfield, Mass, said the arrangement with Goss for Ultron distribution in California, Oregon, and Washington was the result of expanded interest on the Coast and increased production at Springfield. A substantial expansion of vinyl film production facilities was completed there during the past year.

Another factor, Evans said, was the increased supply of vinyl chloride monomer that will become available this year. He pointed out that Monsanto's vinyl monomer unit at the Texas City, Tex., plant would be in partial production in the third quarter of 1952, with full operation expected by the end of the year.

Changes in Personnel

Sanford E. Glick has been appointed assistant sales manager of thermoplastic molding materials for the plastics division. He had joined Monsanto in 1941 as a research chemist and in 1946 was appointed manager of technical service on thermoplastic molding materials. He played an important part in the initial research on production of Monsanto's Lustrex styrene and in the development of dry coloring of styrene. The author of numerous articles for trade magazines, Glick is also a member of the Society of the Plastics Industry and the Society of Plastics Engineers. Currently he is serving as chairman of the SPE professional activities committee on thermoplastic molding materials.

Joshua S. Miller has been named assistant branch manager of the New York office of the plastics division. Prior to joining Monsanto in 1950 in the sales department of the division, he had been associated with Reynolds Spring Co. and Durez Plastics & Chemical Co. Miller is a member of the SPE and played an active part in the organization of the original Society of Plastics Engineers in Detroit in 1941.

Howard A. Gray, research group leader with the Merrimac Division, has been transferred to the vinyl chloride resins technical sales group of the company's plastic division at Springfield, Mass. Gray joined Merrimac in 1935 and has served as group leader of the surface coatings research unit of the textile applications research laboratory and as administrative assistant to the research director.

CANADA

Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., last month reduced prices on its passenger-car, small-size truck, and farm tires and inner tubes by 12½% and on its large-size truck tires by 15%. According to R. I. Raycroft, general sales manager, dropping prices of crude rubber as well as the tax reduction announced last month for the Canadian budget accounted for the tire price cut.

Rubber Stocks Increase

Combined stocks of rubber in Canada—natural, synthetic, reclaim—on January 31 reached 12,491 tons, compared with 9,103 tons a year earlier; while consumption fell to 6,589 from 8,013 tons for the same periods. Domestic production of synthetic and reclaim, however, rose to 7,129 tons from 5,767 tons.

Stocks of natural rubber at the end of January totaled 4,929 tons, against 4,120 on January 31, 1951; synthetic, 5,542 tons, against 3,164; and reclaim, 2,020 tons, against 1,819.

Consumption of natural rubber in January, 1952, amounted to 2,937 tons, contrasted with 4,323 tons in January, 1951; synthetic, 2,526 tons, against 2,227; reclaim, 1,126 tons, against 1,463.

Domestic production of synthetic rubber aggregated 6,810 tons, against 5,288, for the two periods; and reclaim, 319 tons, against 479.

On February 29 combined stocks were up to 13,676 tons from 8,794 on the corresponding date last year; while consumption declined to 6,874 tons from 8,051. Domestic production of synthetic and reclaim advanced to 7,034 tons from 5,186.

Stocks of natural rubber at the end of February totaled 5,218 tons, against 4,153 a year earlier; synthetic, 6,598 tons, against 2,676; and reclaim, 1,860 tons, against 1,965.

Consumption of natural rubber aggregated 2,912 tons, against 4,339; synthetic, 2,854 tons, against 2,225; and reclaim, 1,108 tons, against 1,487.

Domestic production of synthetic rubber totaled 6,678 tons, against 4,726; and reclaim, 356 tons, compared with 460.

New Sales Representatives

Announcement of two appointments in the latex and reclaim division of Dominion Rubber Co., Ltd., Montreal, P.Q., has been made by N. W. Smith, manager, as a result of increased demand for the products produced and distributed by this division.

G. H. Lawrence has been made Ontario sales representative, with headquarters in Toronto. Mr. Lawrence joined the company in 1946 in the general laboratory and transferred to the sales staff in 1947 covering Quebec and Ontario.

W. L. Grignon has been named Quebec sales representative with headquarters in Montreal. Mr. Grignon started with Dominion Rubber in 1943 and also gained valuable experience in the general laboratory. He was with the Royal Canadian Navy from 1944 to 1947 and upon his return to the company was appointed control technician. At the time of his recent appointment he was in charge of production scheduling.

Barringham Rubber & Plastics Co., Ltd., Oakville, Ont., has concluded an arrangement with Monsanto Canada, Ltd., for the supply of Ultron vinyl chloride resins. Besides supplying the resins for Ultron plastics, Monsanto will provide technical assistance for the development of new products in the vinyl field. The arrangement is expected to enable Barringham to expand and improve its service to fabricators, furniture manufacturers, and industrial consumers, E. D. Barringham, company president, said.

To Expand Operations

The City of Sherbrook has concluded an agreement with American Biltrite Rubber Co. (Canada), Ltd., which plans a large extension to its local plant. This company proposed construction of a new building which eventually will cover some 72,000 square feet at a cost of approximately $600,000

First stage of the construction will begin immediately at an estimated cost of $250,000. The city will advance the company $125,000 toward the cost, repayable over 15 years at 5% interest.

In addition, the city will improve the roads leading to the new building, at an estimated cost of $10,000. In return, the company guarantees to give employment to a minimum of 100 more workers than it has on its payroll at present.

OBITUARY

Herbert T. Beal

HERBERT T. BEAL, superintendent, Denman Rubber Mfg. Co., Warren, O., died there on April 28.

His first job in the rubber industry was with the Pennsylvania Rubber Co. He later served with The Mansfield Tire & Rubber Co. and Goodyear of Canada. He joined Denman in 1926 and became superintendent in 1928.

He was born in Butler, Ind., 62 years ago.

He belonged to many of the Masonic orders and many trade organizations.

His wife and a son survive

James E. Carhart

JAMES E. CARHART, assistant manager of the service department, The B. F. Goodrich Co., Akron, O., died at his home in Bath, O., April 15, after an illness of one day.

With the company for 33 years, the deceased was named assistant service manager in 1947. He was formerly manager of the tire conservation department and also had worked in field testing and mileage contract sales, and as a truck and bus tire representative. He is credited with organizing the Goodrich company's Army Training School during World War II.

Mr. Carhart was born in Guilderland, N. Y., 57 years ago.

He was a member of the Methodist Church in Bath.

Survivors include his wife, two daughters, a son, three grandchildren, and two sisters.

C. Laurence Warwick

C. LAURENCE WARWICK, executive secretary, American Society for Testing Materials, Philadelphia, Pa., and its administrative head since 1919, died suddenly April 23.

Mr. Warwick, active in the Society since 1909, when he was graduated from the University of Pennsylvania in civil engineering was made an instructor and assistant professor at the University, serving, at the same time as assistant secretary of ASTM. In 1919 he was appointed secretary-treasurer and in 1946 executive secretary.

The deceased wrote many technical papers and reports dealing with properties and tests of engineering materials and has made notable contributions to the field of standardization and research in materials. During World War II he served on the War Production Board.

Mr. Warwick was head of the Commission of Radnor Township, Delaware County; a member and former vice president of the Engineers Club of Pennsylvania; and a member of the American Society of Civil Engineers, American Association for Advancement of Science, the American Society for Metals, St. David's Golf Club Sigma Tau, and Sigma Xi. He attended Wayne Presbyterian Church, Wayne, Pa., where he resided.

Mr. Warwick was born July 29, 1889.

He is survived by his wife, his mother, a daughter, two sons, two brothers and five grandchildren.

Funeral services were held at Oliver H. Bair Funeral Parlor, Philadelphia, April 26, followed by private burial.

NEWS ABOUT PEOPLE

Harold A. Braendle and **Carl W. Sweitzer**, both of Columbian Carbon Co., 41 E. 42nd St., New York, N. Y., are in Stockholm at the invitation of the Swedish Institution of Rubber Technology to address its spring meeting, May 2 and 3. Their subject is "The Role of Heat in the Carbon Black Reinforcement of Rubber." While in Europe, Braendle and Sweitzer will visit rubber plants in Denmark, England, France, Germany, Italy, Sweden, and Switzerland. They are accompanied by **John W. Snyder**, of Binney & Smith Co., New York, sales agent for Columbian.

John P. Swaggart has joined The Bullard Clark Co., Jacobs Rubber Division, Danielson, Conn., as chief chemist. Previously he had been a chemist and development engineer at Gates Rubber Co., Denver, Colo., where he had been employed 25 years.

Walter R. Bateman has been appointed acting manager of the RFC synthetic rubber plant, Port Neches, Tex., by William I. Burt, vice president, manufacturing, B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, O. Bateman replaces J. Ernest Miller, recently appointed to serve as assistant to the chief of the RFC Synthetic Rubber Division, Leland Spencer. Goodrich Chemical operates the Port Neches plant for the government. Bateman joined the company in 1942 as a chemical engineer and was made production manager at Port Neches in 1945.

Hugh Stewart has resigned as research director and rubber technologist of National Motor Bearing Co., Inc., Redwood City, Calif., and its subsidiaries, Arrowhead Rubber Co., Downey and Long Beach, Calif., and National Seal Co., Van Wert, O. Mr. Stewart will engage in consulting work after June 1.

Andrew G. Colgin has been appointed sales representative in the east Texas and Mississippi oil fields for the New York Belting & Packing Co., Passaic, N. J. He will make his headquarters in Shreveport, La. Mr. Colgin was formerly employed by Patterson-Ballagh Co. as a sales engineer in the Gulf Coast oil fields.

M. H. Keel has been appointed manager of a newly formed advertising department in Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y., and will direct the company's advertising, publications and sales promotion program for agricultural chemicals, fertilizers, solvents, industrial chemicals, and plastics and resins. The company's rapid growth has brought about a need of greater participation of advertising and sales promotion in marketing its expanding list of products to industry and agriculture. Keel joined the advertising staff of Shell Chemical in 1948. He brings to his new position six years of research and operating experience in the chemical and petroleum field and six years of advertising and publicity.

C. Paul Fortner has been appointed assistant director of research of Plax Corp., Hartford, Conn., manufacturer of the squeezable bottle and other plastic products. For the past 11 years Mr. Fortner was employed by E. I. du Pont de Nemours & Co., Inc., at plants in Bridgeport, Conn., Denver, Colo., Oak Ridge, Tenn., and Arlington, N. J. Since 1945 he was in the plastics department at Arlington.

Clifford A. Stephens, formerly a senior compounding engineer for Firestone Tire & Rubber Co., Akron, O., has been engaged as chief rubber technologist for National Motor Bearing Co., Inc., Redwood City, Calif. He succeeds Hugh Stewart, who resigned to engage in consulting work. Mr. Stephens spent 15 years with Firestone and has participated in the development of many important elastomer formulae, both natural and synthetic.

Walter R. Shepperd, who retired after 40 years with Stein, Hall & Co., Inc., New York, N. Y., was tendered a farewell luncheon April 23 by many of his fellow workers. Morris S. Rosenthal, president of the company, was the speaker and presented to Mr. Shepperd, as a token of esteem, a remembrance gift of a sterling silver cigarette box. Mr. Shepperd started with the company in 1912 and was a salesman in the eastern territory. He and his wife plan to move from New York to a new home in the South.

John F. Byrom has been appointed sales engineer, railway division, at the Minneapolis, Minn., office of The Timken Roller Bearing Co., Canton, O. He had previously served in the same capacity at the company's office in Chicago.

George A. Dauphinais has been elected vice president and general manager, Quaker Rubber Corp., division of H. K. Porter Co., Inc., Philadelphia, Pa., and will be in complete charge of all manufacturing and sales activities. At Quaker he has been successively works manager and assistant general manager. Mr. Dauphinais came to the Porter organization in 1947 and has held the position of plant manager with J. P. Devine Mfg. Co. Division and subsequently with Porter, the parent company. Mr. Dauphinias' experience also includes design engineering and product development and manufacturing with General Electric Co. and Elliot Mfg. Co.

A. H. Mickens, of Atlanta, Ga., has been appointed manufacturer's representative for the marine line of Griffith Rubber Mills, Portland, Oreg. Mickens has been a manufacturer's agent in the southern states for the past 20 years. His territory for Griffith will include Virginia, North and South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi, and Louisiana.

R. N. Yates, who for the last 16 years has served Erie Foundry Co., Erie, Pa., in various capacities and for some time as vice president and general manager, is terminating his employment on June 30 to engage in business for himself.

Frederick Gardner has been appointed national sales manager of the plastics division of Plymouth Rubber Co., Inc., Canton, Mass. Mr. Gardner, formerly of Southbridge Plastics, Inc., will maintain sales offices at 267 Fifth Ave., New York, N. Y., for the distribution of Plymouth plastic film for upholstery, automobile seat covers, handbags, belts and various novelties. His activities will include the servicing of furniture, automotive accessories, and novelty apparel manufacturers, as well as firms specializing in the production of home decoration items such as plastic drapes and curtains.

E. D. Youmans, vice president in charge of manufacturing and research, was elected a director of the Okonite Co., Passaic, N. J., at the annual stockholders' meeting on April 15. Mr. Youmans, who started his career with Okonite in 1913 as an assistant in the chemical laboratories, has been in charge of all research activities for nine years. He was also placed in charge of manufacturing operations last year.

M. Robert Skrokov, after completing a training course at the home office in Rochester, N. Y., recently joined the New York office of Taylor Instrument Cos. in the capacity of industrial sales engineer. Skrokov received a degree in mechanical engineering from the College of the City of New York. He served in the U. S. Navy and for two years was a development engineer in the oil industry.

Max F. Moyer of the Air Force Reserve and manager of cycle tire sales for Goodyear Tire & Rubber Co., Akron, O., leaves shortly for a period of active duty with the Air Command and Staff School of the U. S. Air University, Maxwell Air Force Base, Montgomery, Ala., where he will be assigned to the Comptrollers' Staff Officers Course. Colonel Moyer, who will return to Goodyear after competing his service August 18, will be temporarily replaced at the plant by his assistant, **T. F. Judge.**

Felix Salamon is leaving Binney & Smith Co., 41 E. 42nd St., New York 17, N. Y., on July 1 after more than 22 years in the rubber accessories department. He was in at the founding of this department and was made its head in 1933. The principal items under his supervision were fatty acids, chemical plasticizers, and aqueous dispersions of carbon blacks. His future plans have not as yet been determined, but in the meantime he and Mrs. Salamon are vacationing in Europe.

FINANCIAL

Allied Chemical & Dye Corp., New York, N. Y. First quarter, 1952: net income, $9,814,664, equal to $1.11 a common share, against $10,212,945, or $1.15 a share, the year before.

American Cyanamid Co., New York, N. Y., and wholly owned subsidiaries. Three months ended March 31: net earnings, $6,514,695, equal to $1.55 each on 4,201,329 common shares, compared with $9,090,091 or $2.18 each on 4,167,982 shares, in the like period last year; net sales, $93,880,859, against $102,193,058.

American Zinc, Lead & Smelting Co., Columbus, O. Quarter ended March 31: net income, $951,396, equal to $1.29 a common share, compared with $719,628, or 94¢ a share, for the same period in 1951.

Anaconda Wire & Cable Co., New York, N. Y. For 1951: net income, $5,765,586, equal to $6.83 a share, against $5,265,266, or $6.24 a share, in 1950.

Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. First three months, 1952: net income, $1,517,600, equal to 32¢ a common share, compared with $888,625, or 19¢ a share in the corresponding period of 1951; sales, $61,346,171, against $45,351,446.

The Eagle-Picher Co., Cincinnati, O., and domestic subsidiaries. Quarter ended February 28, 1952: consolidated net earnings, $692,675, equal to 70¢ a share, against $914,851, or 92¢ a share, in the corresponding period last year; net sales, $18,924,419, against $21,597,511

Belden Mfg. Co., Chicago, Ill. Initial quarter, 1952: net income, $218,486, equal to 68¢ a common share, against $303,840, or 95¢ a share, a year earlier.

Borg-Warner Corp., Chicago, Ill. For 1951: consolidated net income, $21,219,389, equal to $8.83 a common share, compared with $29,027,224, or $12.16 a share, in 1950; net sales, $369,166,260 (a new high), against $330,924,422; taxes, $41,436,245, against $31,599,000.

First quarter, 1951: net income, $5,313,615, equal to $2.21 a common share, against $5,777,475, or $2.41 a share, in last year's period; net sales, $89,655,238 against $100,600,870.

Boston Woven Hose & Rubber Co., Cambridge, Mass. Six months to February 29, 1952: net income, $366,511, equal to $4.03 a common share, compared with $754,357, or $8.57 a share, a year earlier; net sales, $9,559,953, against $11,154,411.

Brunswick-Balke Collender Co., Chicago, Ill. First quarter, 1952: net loss, $250,873, against $100,502 loss in the first quarter last year.

Circle Wire & Cable Corp., Maspeth, L. I., N. Y. For 1951: net profit, $2,064,376 equal to $2.75 a share, against $2,120,679, or $2.82 a share, in 1950.

Crown Cork & Seal Co., Baltimore, Md. Initial quarter, 1952: net income, $161,889, equal to 2¢ a common share, contrasted with $960,664, or 68¢ a share, in the 1951 quarter.

DeVilbiss Co., Toledo, O. Three months ended March 31: net profit, $222,675, equal to 74¢ a common share, against $207,860, or 69¢ a share, in the 1951 quarter.

Dewey & Almy Chemical Co., Cambridge, Mass. March quarter, 1952: net loss, $23,529, contrasted with earnings of $363,746, in the 1951 quarter; net sales, $5,787,961, against $7,125,801.

Diamond Alkali Co., Cleveland, O. Initial quarter 1952: net income, $1,646,869, equal to 67¢ each on 2,260,103 common shares, compared with $1,658,391, or 73¢ a share in last year's quarter; net sales, $20,501,624, against $18,977,055.

Dow Chemical Co., Midland, Mich. Nine months ended February 29, 1952: net profit, $25,706,753, equal to $3.57 a share, against $29,108,262, or $4.31 a share, a year earlier.

Flintkote Co., New York, N. Y. Twelve weeks to March 22: net income, $382,282, equal to 24¢ a common share, contrasted with $1,407,821, or $1.06 a share, in the corresponding period last year.

General Electric Co., Schenectady, N. Y. Quarter ended March 31: consolidated net income, $29,024,191, equal to $1.01 a common share, against $34,996,395, or $1.21 a share, in the 1951 quarter; net sales, $560,556,576, against $569,688,610.

Firestone Tire & Rubber Co., Akron, O., and subsidiaries. Three months ended January 31, 1952: net profit, $9,317,550, equal to $2.35 each on 3,903,368 common shares, compared with $10,272,869, or $2.60 a share, in the corresponding period a year earlier; sales, $224,064,005, against $211,042,771.

General Motors Corp., Detroit, Mich., and consolidated subsidiaries. First quarter, 1952: net profit, $127,023,260, equal to $1.42 a common share, compared with $141,520,651, or $1.58 a share, a year earlier; net sales, $1,793,085,048, against $1,959,879,617.

Goodall Rubber Co., Trenton, N. J. For 1951: net earnings, $420,393, equal to $4.30 a share, against $274,081, or $2.91 a share, the year before; net sales, $10,686,112, against $6,831,464.

Hewitt-Robins, Inc., New York, N. Y. First quarter, 1952: net earnings, $235,327, equal to 82¢ a common share, against $282,163, or $1.01 a share, a year earlier; net sales, $9,249,589, against $8,395,120.

Byron Jackson Co., Los Angeles, Calif. March quarter, 1952: net earnings, $366,910, equal to 69¢ a common share, compared with $384,054, or 72¢ a share, a year earlier.

Johns-Manville Corp., New York, N. Y. March quarter, 1952: net income, $5,508,387, equal to $1.74 a common share, against $6,292,995, or $1.99 a share, in the corresponding period last year.

Intercontinental Rubber Co., Inc., New York, N.Y., and subsidiaries. Year ended December 31, 1951: net income, $473,625, against $73,678 in the year ended December 31, 1950; sales of guayule rubber, $1,782,452, against $697,229; U.S. and Mexican income taxes, $207,671, against $0; current assets, $1,700,713, current liabilities, $240,120, against $1,385,574 and $28,275, respectively, on December 31, 1950.

I. B. Kleinert Rubber Co., New York, N. Y. For 1951: net earnings, $401,100, equal to $2.59 a common share, contrasted with $491,053, or $3.11 a share, in 1950.

Koppers Co., Inc., Pittsburgh, Pa. First three months, 1952: net profit, $2,242,985, equal to $1.12 a common share, against $2,604,599 or $1.52 a share, in the 1951 period.

Minnesota Mining & Mfg. Co., St. Paul, Minn. First quarter, 1952: net profit, $3,740,188, equal to 47¢ a common share, compared with $3,925,478 or 49¢ a share, in the first quarter of 1951: sales, $43,973,453, against $44,358,553.

National Automotive Fibres, Inc., Trenton, N. J. Quarter ended March 31: net earnings, $403,926, equal to 41¢ a common share, contrasted with $1,522,140, or $1.53 a share, in the like period last year.

New Jersey Zinc Co., New York, N. Y. For 1951: net profit, $9,913,553, equal to $5.06 a common share, against $10,024,294, or $5.11 a share, in the preceding year.

Monsanto Chemical Co., St. Louis, Mo., and consolidated subsidiaries. First three months, 1952: net income, $5,389,241, equal to $1.00 a common share, compared with $5,612,739, of $1.12 a share, in the 1951 period; net sales $63,396,201 against $67,936,955.

Okonite Co., Passaic, N. J. For 1951: net income, $1,509,886, equal to $10.12 a share, against $853,154, or $6.22 a share, the year before.

Initial quarter, 1952: net income, $530,971, equal to $3.56 a common share, against $406,593, or $2.72 a share, in the 1951 period.

Phelps Dodge Corp., New York, N. Y. First quarter, 1952: net earnings, $9,200,000, equal to $1.81 a capital share, against $12,700,000, or $2.50 a share, in the 1951 period.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. Three months to March 31: net earnings, $19,772,140, equal to $1.37 a share, against $15,882,271, or $1.26 a share, in the similar quarter last year.

Pittsburgh Coke & Chemical Co., Pittsburgh, Pa. First three months, 1952: net earnings, $736,000, equal to 87¢ a common share, compared with $798,000, or $1.06 a share, in the corresponding period of 1951.

Pittsburgh Plate Glass Co., Pittsburgh, Pa. March quarter: net income, $8,731,726, equal to 97¢ a common share, against $10,744,464, or $1.19 a share, a year earlier.

St. Joseph Lead Co., New York, N. Y., and domestic subsidiaries. First quarter, 1952: net income, $3,575,942, equal to $1.45 each on 2,469,320 capital shares, compared with $3,817,246, or $1.55 a share, in last year's quarter; net sales, $30,864,031, against $29,612,140.

Seiberling Rubber Co. of Canada, Ltd., Toronto, Ont., Canada. For 1951, net profit, $135,536, or $2.71 a share, against $274,672, or $5.49, a share, in 1950.

Shell Oil Co., New York, N. Y. March quarter, 1952: consolidated net profit, $24,284,149, or $1.80 a share, against $22,393,649, or $1.66 a share, in the like period last year.

Thermoid Co., Trenton, N. J., and subsidiaries. For 1951: net income $1,742,460, equal to $2.02 each on 800,000 common shares, compared with $1,927,895, or $2.26 each on 797,000 shares, in 1950: net sales, $37,836,200, against $28,608,607; federal and Canadian income taxes, $1,516,100, against $1,715,920; federal excess profits taxes, $103,250, against $337,500.

Three months to March 31: net profit, $274,316, equal to 30¢ a common share, against $450,811, or 52¢ a share, in the same period of 1951.

U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y. Twelve weeks ended March 23, 1952: net income, $48,454, equal to 39¢ a preferred share, compared with $127,898, or $1.00 a share in last year's weeks.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Anaconda Wire & Cable Co.	Com.	$0.75	Apr. 22	Apr. 10
Baldwin Rubber Co.	Com.	0.20 extra	Apr. 25	Apr. 15
		0.15 q.	Apr. 25	Apr. 15
Borg-Warner Corp.	Com.	1.00 q.	June 2	May 14
	6% Pfd.	3.00 s.	June 16	June 2
Boston Woven Hose & Rubber Co.	Com.	0.75	May 26	May 15
Brown Rubber Co., Inc.	Com.	0.25	June 2	May 19
Collins & Aikman Corp.	Com.	0.40	June 2	May 20
Crown Cork & Seal Co.	Com.	0.25 q.	May 16	Apr. 8
	$2.00 Accum. Pfd.	0.50 q.	June 14	May 20
Dayton Rubber Co.	Com.	0.50 q.	Apr. 25	Apr. 10
	$2.00 Cl. A.	0.50 q.	Apr. 25	Apr. 10
Denman Tire & Rubber Co.	Com.	0.10 q.	Mar. 31	Mar. 21
Detroit Gasket & Mfg. Co.	Com.	0.25 q.	Apr. 25	Apr. 10
De Vilbiss Co.	Com.	0.25 q.	Apr. 21	Apr. 11
Endicott-Johnson Corp.	Com.	0.40	Apr. 1	Mar 21
		1.00 q.	Apr. 1	Mar 21
Firestone Tire & Rubber Co.	Com.	0.75	Apr. 21	Apr. 4
	Pfd.	1.12½ q.	June 1	May 15
General Motors Corp.	Com.	1.00	June 10	May 15
	$5.00 Pfd.	1.25 q.	Aug. 1	July 7
	$3.75 Pfd.	0.93¾ q.	Aug. 1	July 7
General Tire & Rubber Co.	Com.	0.50	May 30	May 20
Goodall-Sanford, Inc.	Com.	0.37½	June 2	May 15
	4% Pfd.	1.00 q.	June 2	May 15
	6% Pfd.	0.75 q.	June 2	May 15
Goodyear Tire & Rubber Co.	$5.00 Pfd.	1.25	June 16	May 15
	Com.	0.75	June 16	May 15
Jenkins Bros.	Com.	0.25	Mar. 28	Mar. 20
	Fdrs.	1.00	Mar. 28	Mar. 20
Johnson & Johnson	3½% Pfd. B.	0.87½ q.	May 1	May 1
	4% Pfd. C.	1.00 q.	May 1	May 1
	Com.	0.25q.	June 11	May 26
Lea Fabrics, Inc.	Com.	0.37½	May 29	May 9
Lee Rubber & Tire Corp.	Com.	0.50 extra	May 1	Apr. 15
		0.75 q.	May 1	Apr. 15
Link-Belt Co.	Com.	0.60 q.	June 2	May 5
Okonite Co.	Com.	0.50 q.	May 1	Apr. 14
O'Sullivan Rubber Co.	Pfd.	0.50 accum.	Apr. 1	Mar. 15
Parke, Davis & Co.	Com.	0.45	Apr. 30	Apr. 9
Seiberling Rubber Co.	Com.	0.25 q.	June 1	May 10
	4½% Pr. Pfd.	1.29 q.	July 1	June 15
	5% Pfd. A.	1.25 q.	July 1	June 15
Swan Rubber Co.	Com.	0.22	Apr. 1	Mar. 22
Thermoid Co.	Pfd.	0.62½ q.	May 1	Apr. 10
Union Asbestos & Rubber Co.	Com.	0.25 q	July 1	June 10
United States Rubber Co.	.....	200% Stk.	May 14	Apr. 23

GAGE STAYS UNIFORM WITH CALENDER ROLLS ON TIMKEN® BEARINGS

Roll neck wear is eliminated, downtime minimized

WITH calender rolls mounted on Timken® tapered roller bearings, the gage of plastic film and rubber sheeting *stays* uniform. Timken bearings keep rolls in accurate alignment longer than is possible with sleeve type bearings. Uniform gage is maintained the length of the sheet.

With Timken bearings there is no friction between the roll neck and the bearing. Roll neck wear is eliminated. As a result, calenders maintain precision with fewer overhauls. And since roll necks require no machining, downtime is minimized.

The true rolling motion of Timken bearings and smooth surface finish of their rollers and races virtually eliminate friction. Wear within the bearing is negligible, calender roll precision is maintained for longer periods of time.

Timken bearings enable calenders to hold gage to minimum tolerances. Yield is increased—you get more yards of film per pound of raw material.

The tapered construction of Timken bearings enables them to take radial and thrust loads in any combination. And line contact between rollers and races gives Timken bearings load-carrying capacity to spare.

Get the advantages of Timken bearings in your calenders, mills, refiners and mixers. For full information, write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

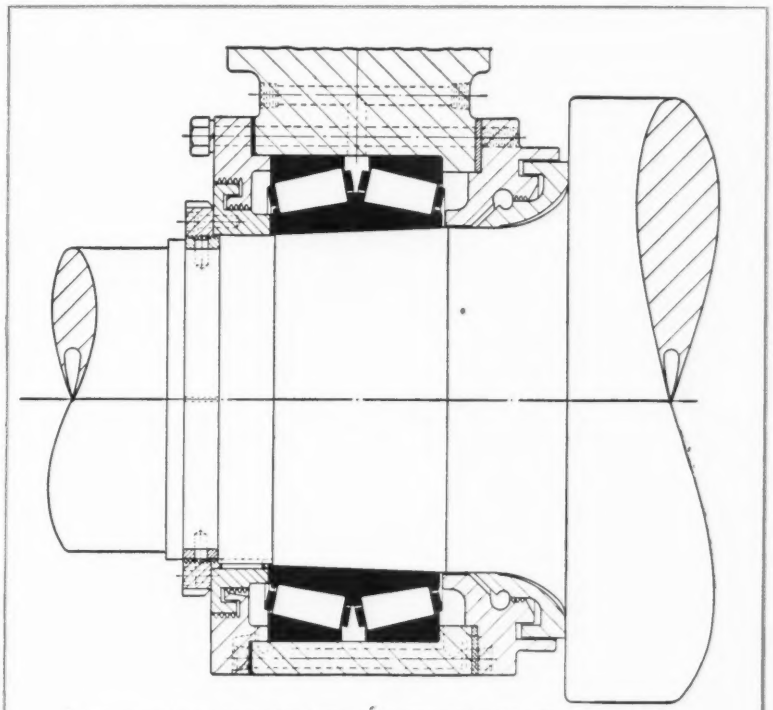


Diagram shows how calender rolls are mounted on Timken tapered roller bearings to maintain uniform gage of plastic film and rubber sheeting.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST ←◎→ LOADS OR ANY COMBINATION ✳

Sun Oil Co., Philadelphia, Pa., and subsidiaries. For 1951: net income, $45,353,643, equal to $6.85 each on 6,564,231 common shares, compared with $36,291,498, or $6.02 each on 5,964,624 shares, the year before; federal income taxes, $21,900,000, against $9,400,000.

Union Carbide & Carbon Corp., New York, N. Y., and subsidiaries March quarter, 1952: consolidated net income, $37,653,520, equal to 81¢ a common share, compared with $41,388,365, or $1.01 a share, in the first quarter of 1951; sales, $231,359,923, against $224,787,433.

SPI Standard

(Concluded from page 246)

Therefore the proposed course of action for the immediate future is to have the suggested commercial standard on vinyl plastic film disseminated by the Department of Commerce and at the same time have the trade-practice regulations approved by the FTC and established as the code of business procedure for the industry, it was said.

Smash-Proof Acid Carboys of Polyethylene

A SMASH-PROOF carboy equipped with polyethylene bottles of 6½ and 13 gallons' capacity is now available for shipment of industrial acids, caustic soda, hydrogen peroxide, photographic chemical solutions, and many other liquids. The polyethylene bottles are blow-molded in one piece by Plax Corp., Hartford, Conn., and the unique plywood-jacketed carboy containers are being introduced by the Greif Bros. Cooperage Corp. of Delaware, Ohio.

This new unbreakable carboy has passed tests necessary for Bureau of Explosives recommendation for ICC approval to ship hydrofluoric acid and electrolyte sulfuric acide solution.

The new carboy is round, instead of square, as with old-style carboys, and occupies only half the shipping or storage space formerly required. Thirteen-gallon boxed glass carboy bottles of similar capacity weigh approximately 70 pounds. The polyethylene-plywood carboy unit weighs only 29 pounds, thus affording up to 60% saving on the cost of the shipping package alone. In addition, the polyethylene bottle will stand the effects of low temperatures and high altitudes, it is further claimed. The contents of the bottle will simply cause the bottle to flex and expand, but not to crack if the contents freeze or are exposed to variation in atmospheric pressure. Wall thickness of the bottle is one-tenth of an inch. Filled samples have been dropped from various heights on to solid concrete without breakage or leakage at a temperature of —10° F.

The new carboy has an outer jacket constructed of phenolic-bonded water resistant plywood with four-ply walls supported with three-ply hoops securely stapled on each end, and with five-ply heads and bottoms. The inner surface of the jacket is treated with micro-crystalline wax, and the outer surface, including all metal parts, is coated with an acid-resistant clear plastic solution.

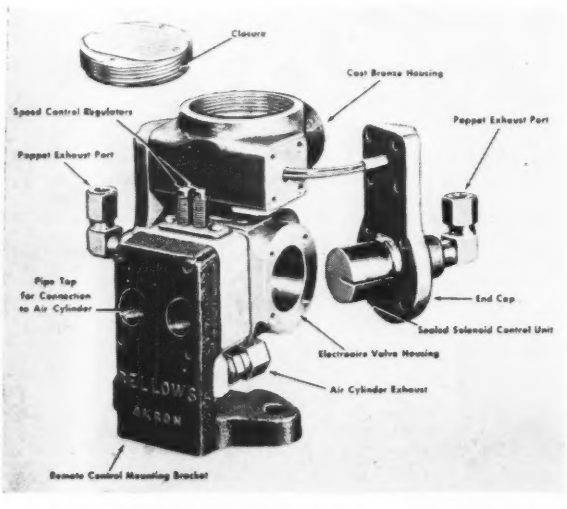
Each bottle has a heavy-walled molded polyethylene screw cap with a separate special inner polyethylene liner. A dome-shaped phenolic outer screw cap is provided to protect the neck against puncture by sharp objects.

Explosion-Proof Air Valve

A NEW series of electrically controlled, explosion-proof, air powered valves has been announced by Bellows Co., Akron, O. Designated the EXV Electroaire valves, they are modifications of the company's standard Electroaire valve. Each valve is an integral unit of a four-way directional slide valve, solenoid control units, and piston-rod speed regulators. The valves meet the Underwriters' standards for Group D, Class 1, wiring in hazardous locations and may be safely used in atmospheres containing gasoline, petroleum, naphtha, solvent vapors, or other hazardous gases or dusts.

Electrically controlled but air powered, these valves differ from conventional solenoid operated air valves. Instead of using power solenoids to shift the valve, the Electroaire uses the air it directs to shift the slide valve. Tiny, sealed, eight-volt solenoids serve as triggers to release the pressure of the incoming air against either side of a floating piston which operates the slide valve. The plungers of these solenoids move only 1/32-inch, and the solenoids will operate continuously at speeds up to 2,200 movements per minute without hum, pounding, or overheating, it is further claimed.

The EXV Electroaire valves are made in three models, 5A, 10A, and 10B, each built in a range of sizes. A disassembled Model 5A is shown in the accompanying photograph. The unit is mounted on an adapter block and arranged for remote-control operation of a conventional air cylinder up to three inches in bore. The sealed solenoid control units are attached to cast-bronze end caps drilled to permit the switching and ground wires from the solenoids to feed into the cast-bronze housing. The end caps are also drilled to provide exhaust ports for the air used in shifting the directional valve. The air cylinder exhaust ports are located underneath the valve housing. The two-speed regulators provide independent control over the advance and retract strokes of the air cylinder, and separate speed control valves are not required.



Model EXV 5A Electroaire Valve Showing Assembly of Major Components

Rubber and Plastics in Australia

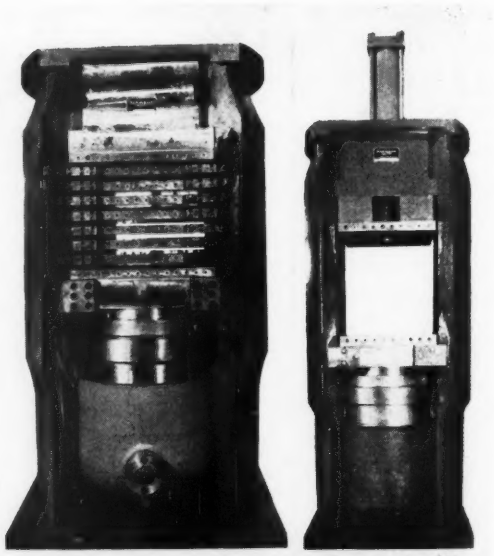
To demonstrate road construction with use of rubber powder, a section of the main outlet to the south of Sydney was laid with a bitumen-rubber powder composition, under the direction of A. R. Smee, roads consultant of the British Rubber Development Board, who was visiting Australia.

The Colonial Sugar Refining Co. of Australia and the Distillers Co. of Britain have merged their chemical interests in Australia to form C.S.R. Chemicals Pty. Ltd., which will produce cellulose acetate for the rayon and plastic industries here as well as acetic anhydride and a wide range of industrial and pharmaceutical chemicals.

The development of Australia's plastics industry will make a great leap forward when plans of the Imperial Chemicals Industries of Australia & New Zealand, Ltd., are realized. The company is reported to have ordered equipment which is expected to make Australia independent of foreign supplies of plastics within three years.

Another news item from Australia states that before the end of the current year, a plastics factory, brought over complete from Germany, will be operating in Sydney. It seems that a local business man has just made arrangements for the dismantling and shipment to Australia of the entire plant of a German firm, Rehauer Plastics, and that eight of the German workmen and their families are en route for Australia too in order to get the plant going.

New Machines and Appliances

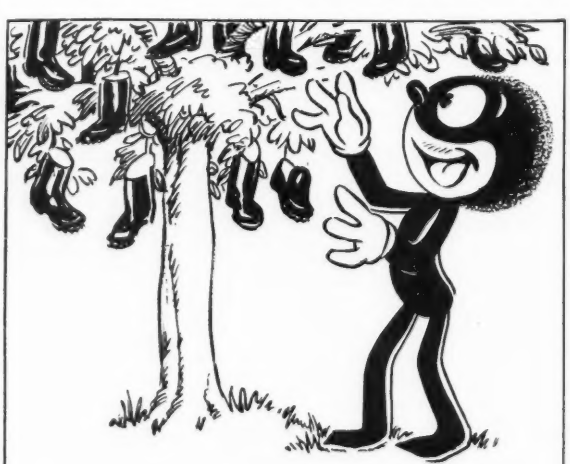


(Left) **30- by 30-Inch Circular Side Plate Press with 30-Inch Ram;** *(Right)* **24-Inch Barrel Press with Transfer Cylinder**

New Barrel-Type Press

A NEW barrel-type press, capable of providing much higher platen pressures with less deflection, has been developed by Adamson-United Co., Akron, O., in a range of sizes from single and duplex laboratory units with 12- by 12-inch platens to medium-size units with 32- by 32-inch platens. Larger sizes are being designed and will be available in the near future. The press, on which patents have been issued, is known as the Adamson barrel press and is intended for use in molding close-tolerance items, such as gas masks, carburetor diaphragms, crash helmets, etc.

In this new-type press the ram diameters can be made the same as the width of the platens, with the result that platen pressure



Easy?

SEE PAGE 164

Buy "Know-How"

FOAMOSOL is a recent development in the vinyl dispersion field. Vinyl Foam from this product may be produced without pressure—only heat is required. This special plastisol may be spread coated, molded or cast. With all of the chemical resistance of vinyl products, plus the ease of handling, this compound opens a new field to users of sponge or foam. Old products may be improved using this new type of foam, or new products may be developed to take advantage of the outstanding characteristics, both chemical and physical. Take advantage of Watson-Standard know-how—write today.

• We can help you to improve or develop new products.

Watson-Standard CO.

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PLASTICS • INDUSTRIAL FINISHES • CHEMICALS

is approximately 70% higher than is possible on conventional presses. Deflection is reduced to a minimum as the ram area approaches the area of the bolster.

The press has circular side plates that conform to the shape of the hydraulic press head. These three component parts, which are subjected to the hydraulic load, are all accurately machined to jigs. The curved construction of the side plates contributes to increased rigidity of the press.

The conventional method of using studs for holding the strain members or side plates to the cylinder and press head have been discarded; the studs are replaced by top and bottom register plates. These plates also accurately machined to conform to the outside machined surface of the members to which they are attached, eliminate the old difficulty of loosened studs and resultant wear on the very important tongue-and-groove connection between strain plates and adjacent members. The curved side plates are of cast-steel and designed to afford accurate guiding of bolster and platens. This type of press is easily accessible to the operator from both front and rear. The design lends itself to any number of press openings, as intermediate platen hangers are very easily arranged in the barrel press.

The barrel press is also being used in transfer molding. This conversion is simple as a transfer cylinder and pot are built into the press itself, and the design lends itself admirably to this type of molding. The required pressures can easily be produced; deflection is held to almost an unheard of minimum, with the elimination of the normal "flash."

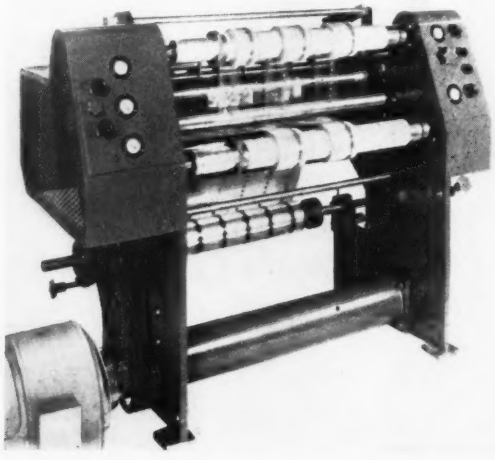
Slitting and Rewinding Machine

A NEW Model 585 slitter and rewinder for plastic film, tape, and foil has been announced by John Dusenbery Co., Inc., Verona, N. J. Adapted for both stationary razor-blade and rotary burst-type cutting, the machine is designed primarily for use in large-scale production operations, but can also be used for engineering development purposes.

This new machine is suitable for use on film widths of 32, 42, 52, and 62 inches; gives a rewind diameter of 12 inches; takes core diameters of one and three inches; gives a minimum slit width of 3/8-inch; and operates at speeds up to 500 feet a minute, depending on the static created. Features of the new unit are air-operated tension controlling devices on the payoff and rewind and adjustable slip clutch drive of the main pull rolls and grooved cutting roll to provide control of film stretch between these rolls.

The razor-blade slitting equipment has standard razor blades running in grooves spaced 1/16-inch apart in the slitting roll. The blade holders are mounted on a common shaft that is raised and lowered by a worm and worm wheel. Raising and lowering of the shaft can be done from either the front or the rear of the machine. The burst cut slitting equipment has male knives three inches in diameter and 0.019-inch thick mounted on clamp-type holders. These knives run in grooves in the four-inch diameter slitting roll.

The rewind clutches are independent of each other and are operated through diaphgram-type air cylinders controlled by a precision pressure regulator. This feature permits the operator to preset tension and to change tension as the roll builds up.



Dusenbery Model 585 Slitter and Rewinder

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"BIG CHIEF"
with production
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EASY PROCESSING

Marbon "8000"

Has the Low Cost Production answer for your Rubber Compounds!

- Elimination of expensive Masterbatching operations.
- Lower power consumption on highly loaded stocks.
- Versatility with Natural, Synthetic and Reclaim rubbers.
- Plasticizing action at processing temperatures.
- Higher unit reinforcement.

ORDER NOW! STOCK READILY AVAILABLE!

Marbon

MARBON CORP.

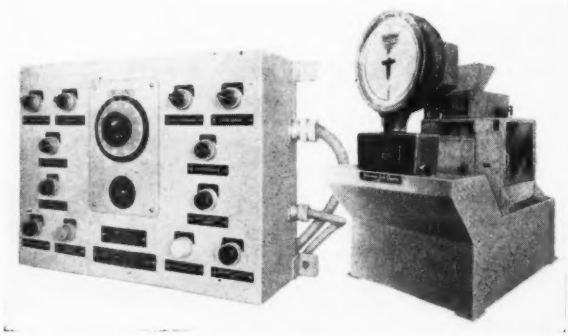
GARY, INDIANA

SUBSIDIARY OF BORG-WARNER

It BLENDS as it STRENGTHENS as it IMPROVES

The rewind mandrels are built on the differential winding principle, with cores and spacers alternating on each mandrel. When an adjustable pressure is exerted axially on the mandrel, each core spacer surface acts as a small slip clutch and permits the individual rolls to compensate for out-of-caliper conditions. The rewind mandrels are held in the machine by air-operated locks designed to remove all end play and shake.

The mill roll brake is air operated from the front of the machine by means of a regulator and gage and can be disconnected easily from the shaft bearings. Precision lateral and radial adjustments are provided for lining up the axis of the mill roll with the slitting roll. The cant roll, at the rear of the machine, is used to straighten out the web as it leaves the mill roll. The machine has heavy welded steel side frames connected by torque tubes; sealed ball bearings; roller chain drive to the slip clutches; and precision gear drive of the slitting and pull rolls.



Richardson Select-O-Weigh Components Include *(Right)* Automatic Hopper Scale and *(Left)* Master Control Panel

Automatic Compound Weighing

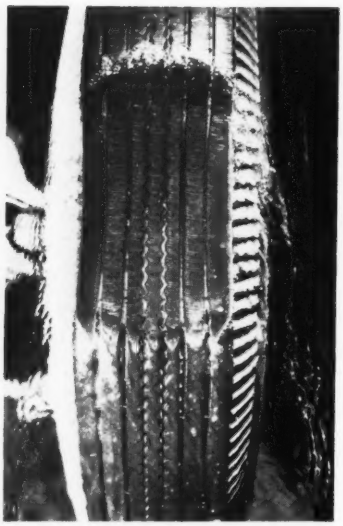
BY APPLICATION of a single servo-mechanism used extensively in processing controls, the Richardson Scale Co., Clifton, N. J., has developed Select-O-Weigh, a truly automatic cumulative and consecutive weighing system for use throughout the chemical and processing industries. The system places automatic weighing methods well within range of even small plants by having one automatic scale accomplish the work done previously by up to 12 separate scales. Select-O-Weigh guarantees complete flexibility in formula variation for all proportioning operations.

The heart of the system is a simple, foolproof electronic circuit with no arcing contacts. A standard-type Richardson automatic scale is used as the weighing element, with a pendulum dial scale acting as the force-measuring component. A master control panel for any particular system is built to include as many setting dials as there will be formula ingredients, with one dial for each ingredient up to a maximum of 12. The scale operator, who may be located in any part of the plant remote from the actual weighing operation, sets each dial on the panel to correspond with the amounts of each ingredient in the formula. Both the timing and the sequence of adding materials are selectively controllable.

After the control panel has been set up, the "start" button is pressed. This actuates a screw feeder mechanism which delivers to the automatic scale the amount of material set on the first control dial, and then stops. This action is visible on the scale dial. Then, depending on the settings of the various selections and controls, the scale either discharges to a mixer or goes on to the next ingredient, repeating the cycle, and adding this next ingredient to the weigh hopper in the amount indicated by the second control dial. This action repeats until all the ingredients have been accurately weighed into the scale hopper.

Following discharge of the automatic scale hopper, a tare check circuit is brought into operation to prevent the start of a new cycle unless all material has been cleared from the hopper and the unit is in perfect empty balance. This is accomplished by electrically verifying the repositioning of the dial scale pointer at exact zero. Control circuits may be arranged to provide either (1) delivery of consecutive weights of varying amounts according to a predetermined schedule, or (2) accumulation of a total batch of a preselected formula and its discharge into a surge hopper or mixer. A further elaboration of the system is the operation of repeater dials to indicate remotely the position of each scale pointer.

New Goods and Specialties



Gripping Action of the New Life-Saver Tubeless Tire Shown in This Picture of a Fast Stop Made through Glass from Underneath the Car

New Non-Skid Tubeless Tire

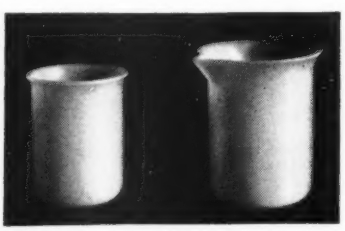
THE B. F. Goodrich Co., Akron, O., which recently was granted patents covering the basic features of tubeless tires, has developed a new tubeless tire which, it is claimed, has improved non-skid characteristics on wet pavements, shortens stopping distances on ice as much as 30%, and gives up to 15% added tire mileage.

The new Life-Saver tubeless tire has a new tread design consisting of more than 10,000 tiny blocks of rubber each only 0.0625-inch wide (16 to the inch) and approximately ¼-inch deep. When the brakes are applied, the blocks act like fingers and grip a wet surface, wiping it so dry that a match can be lighted on it, it was said.

The tire also improves traction or starting ability on slippery roads. On ice, the tire starts up 114% better than ordinary tires, on wet streets up to 40% better, and on snow up to 25% better.

The new block design of the tread also gives quieter, smoother operation, Goodrich tire engineers further declare, because the spacing of the tiny blocks raises the pitch of the tire noise into a range too high to be audible to human ears.

The new Life-Saver tubeless tire will sell at the same price as the present tubeless tire and will be available throughout the nation after April 7 in all popular low-pressure sizes.



Molded Polyethylene Beakers

Plastic Beakers

MOLDED one-piece polyethylene beakers, complete with pouring spout and made in capacities of 250 and 400 milliliters, are now available from American Agile Corp., Bedford, O. The new products are identical in design to standard glass beakers, but offer the reported advantages of being unbreakable and completely resistant to most mineral acids, including hydrofluoric acid and its mixtures, and a large number of organic chemicals at temperatures between —20 and +150° F.

Double Eagle Improved Non-Skid Tire

A TIRE designed to give as much as 42% more non-skid mileage than the standard tire of today and a new safety tube giving complete protection against both punctures and blowouts, have been announced by the Goodyear Tire & Rubber Co., Akron, O.

The new Double Eagle tire cord is all of nylon; the sidewalls are of natural rubber, and the tread of cold (LTP GR-S) rubber, and there is 26% more non-skid tread thickness offering thou-

The New Double Eagle Tire and the Improved Lifeguard Tube, with Dr. Dinsmore Demonstrating the Puncture-Sealing Properties of the Tube

sands of additional sk'd-resistant miles.

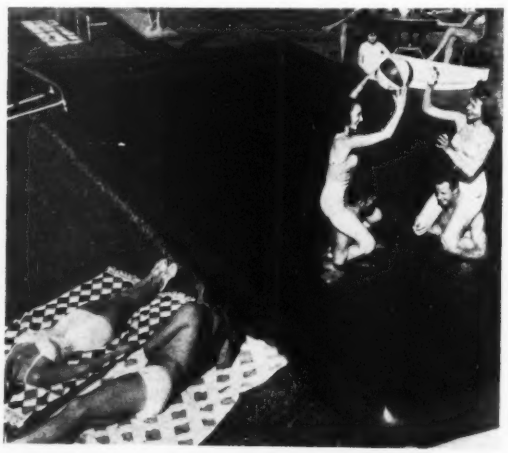
In addition, R. P. Dinsmore, vice president in charge of research and development for Goodyear, stated that the famous LifeGuard tube, introduced 17 years ago as a safeguard against blowouts, provides complete protection against punctures as well as blowouts. Both the tube and the puncture sealant compound used are made of synthetic materials.

Plastic Pool and Cabana

TWO new products made from durable Vinylite plastic sheeting, produced by Bakelite Co., have been announced by Bilnor Corp., Maspeth, N. Y. The products are a full-size, lawn-type swimming pool, and a portable cabana.

Made from 20-gage sheeting, the swimming pool is 27 feet long, 13 feet wide, has a graduated depth of from 3-5 feet, holds more than 10,000 gallons of water, and can accommodate 15 persons comfortably. The pool consists of a liner that fits tightly into an excavation below ground level. An inflatable bumper is fastened to the top of the pool; while a plastic cover protects the pool. Intended for permanent installation, the pool is anchored into the excavation by driving wood corner supports into the ground. The pool is made in two styles, depending on whether drainage is accomplished by a built-in drain for use with a pipe outlet system, or by a sump pump. Total weight of the liner, bumper, and cover is about 195 pounds, and all three components fit into a three-foot-square shipping container. The company will also produce larger or smaller pools to

(*Continued on page 290*)



Vinylite Plastic Sheeting Used in a New Lawn-Type Swimming Pool

where QUALITY *is your first consideration...*

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Carbon Bisulphide
Caustic Soda
Sulphur Chloride
Borax

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Now that you can again manufacture white-wall tires, you will want to prevent production losses that occur if a quality insoluble sulphur is not used. You well know the ugly stains and unsalable off-color product caused by sulphur bloom when ordinary sulphur is used. By using CRYSTEX, guaranteed to contain at least 85% insoluble sulphur, you can produce the cleanest and whitest of white-wall tires.

Let us send you our circular which describes CRYSTEX. It lists various applications of CRYSTEX such as tire carcass stocks, white sidewalls, tube-stocks, re-tread and other repair stocks, mechanicals, naphtha cements, latex dispersions, reclaim stocks and bin stocks. Write for your free copy of this Crystex circular today.

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EUROPE

GERMANY

Huls Again Making Synthetic Rubber

Almost two years after dismantling left the Huls Chemical works with but four out of an original 18 furnaces for butadiene, the concern on November 20, 1951, shipped out the first lot of Buna S produced by it since the ban on production was lifted. Output was at the rate of 500 tons a month, against a maximum of 45,000 tons a year achieved during the war.

At the moment the process followed here involves the preparation of butadiene via acetylene, acetaldehyde, acetaldol, 1,3-butylene-glycol; copolymerization with styrene in aqueous emulsion, and formation of continuous sheet one meter wide and 2-3 millimeters thick. The only styrene rubber presently made is Buna S3, but at any time Buna SS and 1073 may be added. Oil-resistant Perbunan is also prepared.

It cost 4,700,000 German marks to put the factory in working order for a production of 500 tons monthly, a quantity sufficient to cover West German requirements; however, on this small scale, the price (at the end of 1951) came to 4.66 German marks per kilogram, against 2.30 to 2.50 German marks per kilogram for American grades. Huls is therefore understood to be considering an elaborate expansion plan requiring an investment of 15,000,000-20,000,000 marks over a period of three years; production would be on the most up-to-date lines; butylene from cracking gases would be used; output would be raised to 1,500-2,000 tons a month, produced at a price which would make it possible to find export markets for the surplus buna above West Germany's own needs.

Before the manufacture of Buna was permitted again, the Huls works had been producing a variety of products including plastics, solvents, softeners, carbon black, and more recently, all-synthetic fibers; it now again employs more than 8,000 persons.

Stabilizers for Polyvinyl Chloride

Among the products recently developed at the Chemische Werke Huls are new stabilizers for polyvinyl chloride, it was revealed in a paper on "Stabilization of PVC" presented by A. Rosenberg[1] at the meeting of the Rubber and Plastics Section, German Chemical Society, held September 25, 1951, in Cologne. Dr. Rosenberg first discussed American stabilizers for PVC, pointing out that these are frequently without the desired effect on German PVC since the latter, unlike the Geon types chiefly produced in the United States, are emulsion-polymerized and slightly stabilized with sodium bicarbonate. (The so-called Vinnols prepared in Germany are more closely related to the Geon types). Of various Advance stabilizers tested by him, the organic tin compounds No. 3 and 52 (especially the latter) proved most suitable for German PVC.

Good stabilizers, he continued, must fulfill the following requirements:

(1) They must be good acceptors of HCl, and the resulting chlorides must be colorless or white.

(2) Any anion liberated by the HCl must be soluble or at least compatible with PVC.

(3) They must be dienophile—must make a Diels-Alder reaction possible to block unsaturation (and resulting discoloration) when the HCl is removed.

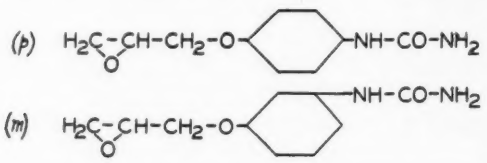
(4) Since under prevailing temperature conditions, oxidation very readily occurs at the double bonds, the stabilizers must easily accept oxygen to prevent this.

(5) Finally stabilizers should be capable of being absorbed in ultra-violet light to divert its harmful effect from the PVC molecule.

Rosenberg then described a very simple test in use at Huls to determine the quality of a stabilizer. Samples of pure PVC or a mixture of 75 parts PVC and 25 parts of Vestinol AH, containing varying amounts of stabilizer, are milled for 50 minutes at 165° C.; every 10 minutes a small piece of the sheet is cut off and mounted on a white card; depending on the efficiency of the stabilizer, the pieces will keep their original light shade or become brownish in color.

[1] *Kunststoffe*, 42, 2, 41 (1952).

The new stabilizers prepared at Huls are based on ureas. It was found that the introduction of an epoxy group in the monophenyl urea molecule makes the stabilizer effective with both the usual German PVC (containing an emulsifier and an electrolyte) and the Geon type PVC; the most effective compounds are p-and m-epoxyphenyl ureas of the following structure:



Both active groups in this stabilizer are HCl acceptors and have the advantage over the metal salts of forming non-ionizable compounds with the chlorine.

Another type of stabilization is achieved by combining two compounds, one of which is a HCl acceptor, while the other has dienophile properties. It was found that a benzalphthalide-type compound which in itself has no stabilizing effect in PVC, when used together with stearates of lead, cadmium, calcium, etc., enhances their stabilizing action.

Chemical Engineering Congress

Fourteen foreign and German technical and scientific societies are expected to participate in the European Congress of Chemical Engineering which has been arranged jointly by the DECHEMA (German Society for Chemical Equipment) and the Société de Chimie Industrielle, Paris, France, scheduled for Frankfurt a.m., May 18-25, in connection with the ACHEMA X, Tenth Chemical Engineering and Appliance Exhibition. At the same time the French organization will hold its XV International Congress of Chemical Engineering; while DECHEMA will have its annual general meeting, also at Frankfurt, a. m.

Approximately 20 papers will be presented by European and American experts on the latest developments in the chemical process and appliance fields, and some 5,000 participants from all parts of the world are expected to attend the Congress. More than 500 firms will show their latest products and developments.

German Trade Notes

The special properties of neoprene are finding increasing recognition in Germany, and minimum requirments of this material for 1952 have been put at 3,600 tons. Of this amount, about 30% will go into flame-resistant conveyor belts for the mining industry, 20% for flame-and-weather-resistant cables

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VORLD

and wires, and 25% for cements, also for the footwear industry. Roll covers, various molded and extruded articles, hose and tubing, rubberized fabrics, dipped goods, etc. will account for the remaining 25%.

The Research Institute of Macromolecular Chemistry of Freiburg has received permission from the Baden Ministry of Public Worship and Education to adopt the name Government Research Institute for Macromoluecular Research.

The manufacture of Orlon on an experimental scale is being planned by the Casella-Farbwerke, Frankfurt-Mainkur; large-scale production for the German market is not looked for until about the middle of 1953.

At the meeting of the Deutsche Kautschuk Gesellschaft held October 11: the following were elected to the board of executives: Erich Konrad, Chairman; Otto Giese, vice chairman; Alfred Tietze; Detlev Schmidt. The council consists of Carl Ruger, Dr. Baumann, G. Fromandi, Dr. Herring, Dr. Koch, Mr. Marquardt, H. Pahl, Dr. Stegemann.

GREAT BRITAIN

Controversy on T. C. Rubber

Diametrically opposed views on results obtained with T. C. (technically classified) rubber have been presented in two articles appearing in recent issues of *India Rubber Journal*. H. C. Harrison,[1] after examining figures for modulus tests on T. C. No. 1 Ribbed Smoked Sheet, as reviewed by Dr. Schidrowitz,[2] finds results disappointing. The figures, as he quotes them are: modulus at 600% E, for red bales (slow curing), 420-750 lb. / sq. in.: for yellow bales (medium curing), 710-1160; for blue (fast curing), 1400-1690; specification limits for the three categories, less than 426, 426-711, and over 711, respectively.

Next he quotes test results on T. C. rubber from French Indo-China, as presented in another review by Dr. Schidrowitz,[3] according to which modulus for red was between 200-900; for yellow, 500-1925; blue, 1125-2225, and points out that here the difference between maximum and minimum for slow curing is 350%; medium, 285% and for fast, 98%, and adds:

"We can obtain better results by blending the rubber during mastication in the factory and again during mixing."

Then Harrison proceeds to show that variability is due not to the raw rubber itself, but to a number of other causes. He quotes statements from several experienced chemists to prove that the use of accelerators has eliminated the variability (regarding cure) of plantation rubber and suggests that the quality of all ingredients as well as of raw rubber needs controlling, and that tests on a factory scale would be preferable to those in the laboratory.

In reply R. G. Newton[4] after commenting on Harrison's "perplexing stand," states that the latter's criticisms are in all cases based on inaccurate representation of facts; he has quoted erroneous specification limits, which should have been 710, 710-1,330, and over 1,330 respectively. Then Harrison has not carefully checked the data for Indo-China—these had been taken by Dr. Schidrowitz from an abstract of a report by the Firestone Tire & Rubber Co., and the abstract had mistakenly quoted minimum modulus for red as 200 instead of 300, a mistake to which Dr. Schidrowitz had later called attention; also the maximum of 900 for this type of rubber referred to a single bale out of 42 taken at random, the next highest figure was 675, which had been duly mentioned by Schidrowitz.

For a fair representation, Newton continues, the range of values within which 90% of the bales fell should have been used, when the Indo-China figures would have read: modulus for red, 375-650 (42 bales); yellow, 500-1250 (86 bales); blue, 1225-1950 (49 bales). These bales, Newton emphasized, were made early in 1950, before the present system of world-wide calibration checks; hence, "the conclusion must be that it was a good start, and that the gratitude of all should go to the French for initiating the scheme."

Some consumers, he adds, have already indicated their satisfaction with the present scheme by deciding to purchase particular technical classes when they can get them. The scheme has certain defects, Newton admits, but they are not those Harrison mentions. The chief complaints are that (1) T. C. rubber is at present restricted to high grade No. 1 Ribbed Smoked Sheet,

[1] Feb. 23, 1952, p. 17.
[2] Oct. 27, 1951, p. 13.
[3] Apr. 21, 1951, p. 628.
[4] Mar. 1, 1952, p. 4.

and (2) it is difficult to obtain large consignments of T. C. rubber; but improvements on both counts are to be expected this year. Finally it is admitted that the Mooney classification (by the shape of the mark) is less successful than the modulus classification, and suggestions from practical technologists are again invited.

Soaring Exports of Rubber Manufactures

British exports of rubber goods, which had already shown steady increase in the post war years up to 1950, made a further considerable advance in 1951, when totals reached a value of £57,740,897, against 34,763,756 in 1950. Tires and tubes of all kinds accounted for more than half the total amount, £33,561,030 in 1951, against 18,835,485 in 1950.

Shipments of manufactured products other than tires, amounted to 24,179,867 in 1951, as compared with £15,928,271 the year before, and included among others, belting (£3,183,333, against £873,810); footwear and accessories (£3,615,459, against £2,100,842); waterproof apparel (£3,991,765, against £2,968,735). Exports of plastics and rubber working machinery were valued at £1,202,035, against £1,049,672 in 1950.

Imports of crude rubber and allied materials (gutta percha, balata, waste and reclaim, synthetics) reached 369,013 tons, of which 60,484 tons were reexported.

Geigy-Hardesty Sebacic Acid Plant

Until recently sebacic acid had to be imported from the United States. Through the collaboration of Hardesty Chemical Co., Inc., with Geigy Co., Ltd., which together have formed the new Geigy-Hardesty Co., Ltd., a factory has been set up at Trafford Park, Manchester, said to be one of the most up-to-date sebacic acid plants in the world. While the factory has been in production about a year now, no details as to amount of output are yet available, but it is said to be substantial. The plant is making plasticizers for various types of synthetic rubber compounds, PVC, and other plastics; the output also includes the new polymeric plasticizers and viscous alkyd or polyester-type synthetic resins.

SPAIN

A plastics conference, the first of its kind here, is scheduled for Madrid, May 12-15, at the same time an exhibition will be opened to show the development of the industry and to draw attention of consumers to the many possibilities of plastics.

FAR EAST

MALAYA

Newsweek on Malaya

The April 28 issue of *Newsweek* carries a story by Compton Pakenham, chief of that magazine's Tokyo bureau, entitled "Malaya: How Planters Endure a Sneak War." Mr. Pakenham's personal experiences in traveling through Malaya's rubber plantations and talking with estate managers and others are recorded.

Mention is made of the income the guerrillas collect from stealing rubber and selling it through country dealers, usually Chinese. A spokesman for the Malayan rubber industry is quoted as saying:

"Conservatively, the guerrillas must be collecting $3,275,000 per month this way. Maybe they are not fighting for an immediate reward, but bandits are well paid. Communism in Malaya today is a racket that produces big profits."

Mr. Pakenham points out that the Chinese—more than half the population of Malaya—sit on the fence. At present rich Chinese are buying rubber estates considered too dangerous to work because of the bandits. In Chinese hands these estates immediately become quiet and productive.

The new High Commissioner and commander-in-chief of Malaya's armed forces, Gerald Templer, has begun to crack down on the bandits and has planned a campaign called "whispering death." The hope is that if informers can be as well protected as those who keep the bandits supplied with information, the roles can be reversed, and the bandits will find themselves in a demoralizing position.

Wholehearted approval of the new approach is heard on the rubber estates since the planters feel that if the battle is ever to be won, it must be won among the people in the villages who can be induced to stand up against intimidation, stop feeding and helping the bandits, and cooperate actively with law and order, if the benefits of such action are made plain to them.

Against U. S. Government Rubber Policy

Much resentment and anxiety have been caused here by the rubber policy of the United States Government, and seemingly no organization in any way connected with the rubber industry here has failed to protest in strong terms against the "series of measures introduced by the American Government to strangle the natural rubber industry," as the Penang Rubber Trade Association put it. This body, through the Member for Economic Affairs, O. A. Spencer, has urged the British Government to impress on the United States Government the need of placing the industry on a sounder basis. The British Government is recommended to stress that destinational control was enforced in Malaya in a spirit of cooperation with America and at great sacrifice.

The Association said: "We consider the attitude of the United States most unfriendly and unreasonable and calculated to disorganise and jeopardise Malaya's economic structure."

The protest is aimed particularly at the following American measures:

(1) Enforcement of the rejection clause in purchase contracts and limitation of purchases only to certain stock grades;

(2) Refusal to buy more natural rubber for stockpiling purposes and freeing the rubber market "only in name";

(3) Reduction of the selling price of synthetic rubber and exportation of fair quantities in active competition with natural rubber; and

(4) Introduction of a program to expand further the production of synthetic by another 100,000 tons a year together with restrictions on the usage of natural rubber to a minimum figure.

The Malayan Trade Union Council sent a note to the U. S. Government pointing out that rubber smallholders in Malaya are especially hard hit by the reduction in the purchase of certain lower grades, and that American policy of restrictive trade in natural rubber would obstruct efforts of Malayan workers to better their standard of living. A fair price for rubber was essential not only to the welfare of the people of Malaya, but to the success of the anti-Communist campaign.

The Selangor & Pahang Rubber Dealers Association was to cable the U. S. Government to explain the harm being done and to ask for a revision of policy. Smallholders who produce 54% of Malaya's yearly output, Mr. Tee Teh, the president of the Association, underlined, have not the facilities to produce high grades in profitable quantities and are therefore most vulnerable. He accused America of the "ungentlemanly trick" of deliberately depressing the price of rubber and added that prices of American goods had gone up by 1000% in many cases; whereas rubber prices were only about 300% above levels that prevailed before the war.

I. G. Salmond, chairman of the Singapore Chamber of Commerce Rubber Association, speaking at its annual meeting, presented the Malayan case in a temperate, but hard-hitting speech. He found it hard to reconcile American rubber policy with the American Government's general policy of aid to South East Asia, he said. American goodwill toward this area was very evident from the various forms of aid available and so generously offered; yet these aids became insignificant by comparison with the effect on South East Asia—politically and economically—of a stable and economic price for its most important product, rubber.

Nobody in the area, he delared, was justified in grumbling seriously at price reductions caused by normal market factors; but the danger of dissatisfaction entered when subversive propagandists could point out that the price reduction was not due to market factors, but chiefly to man-made restrictions. The right of Americans to buy as cheaply as possible the grades

they want or to reject rubber below the quality contracted for is not disputed.

"But," he emphasized, "surely there is no justification for the authorities, responsible for American rubber policy, exercising those rights in a manner harmful to the producer when the self-same authorities occupy a monopolistic position."

The form of the American rejection clause, he went on, created conditions under which reputable traders in general were unable to sell; as to the grades America is now refusing to buy, it would be difficult to find an answer to undesirable propaganda to smallholders that the chief purchaser of their rubber not only refuses to take it, but prevents others from buying it. The potential buyers are American manufacturers who have always bought the lower grades and for whom many types were created. Furthermore the local remilling industry, the most important in Singapore, besides being a most valuable earner of hard currency, may be gravely affected by present developments, with resultant widespread unemployment among its 5,000 workers.

The easing of exports of American synthetic rubber, the price of which had been reduced to 23¢ (U. S. currency) a pound, was another sore paint, and Mr. Salmond expressed the hope that American policy might be reconsidered so as to give natural rubber a fair chance to compete with synthetic.

Referring to the points at issue in grading, quality, and claims, Mr. Salmond recommended that these should be given serious consideration. However, he added, it was an unfortunate fact that the present methods of both sampling and arbitration in New York were viewed here with the greatest suspicion.

"It is undoubtedly correct that certain unscrupulous packers have indulged in serious quality malpractices, but it is also true that American dealers have continuously bought from concerns which have been blacklisted by the members of this association."

Losses from Terrorism

The high cost of the emergency in loss of planters' lives, in the amount of money spent in defensive measures, in destruction and rubber thefts on estates, has figured prominently in the 1951 reports of several planting organizations in Malaya.

The chairman of the Incorporated Society of Planters noted that 64 planters had been killed by Communist terrorists since the beginning of the emergency.

The Johore Planters' Association stated that during 1951 it had received 207 reports of damages to trees on estates in the state of Johore, covering 279,997 trees over 2,866 acres. This acreage represents only a small proportion of the 470,000 planted acres which the association represents, so that taken as a whole, the damage is not serious. Individually, however, estates suffered great losses when computed in terms of capital outlay and loss of production and of profits. The association criticized the government's attitude on estate protection, and its ineptitude was held to be the sole direct cause for the deterioration of the morale of the security forces.

Discussing the situation on estates in the Malayan Federation, the United Planting Association of Malaya, put the number of trees damaged at 600,000, costing the country six million dollars (S. S. currency) during 1951. Estates also had to bear a total cost of sixteen million dollars for defense measures. Regrouping of labor, undertaken by the authorities, to prevent aid in the form of foods supplies from going to the terrorists and to provide information for security forces, had been of little help to estates since these efforts had often been ill-considered and unnecessary and caused estates endless trouble.

A feature of the report is the comparison of the Malayan rubber industry with that of Indonesia. In 1951 the Federation of Malaya output came to 603,880 tons, or 32.5% of total world rubber production, as compared with 692,585 tons, or 37.4% in 1950. Net Malayan exports in 1951 were 34.4% of the world total, against 36.9% in 1950. By contrast, Indonesia's share in world production had risen from 37.2% in 1950 to 42.5% in 1951, and its share of exports from 38.8 to 41.8%. The recent devaluation of the Indonesian Riupiah seemed calculated to give Indonesia an extra exchange advantage in dollar markets, it was added, and to encourage direct sales to American account countries.

THAILAND

The government-operated Thai Rubber Factory is said to be planning the production of tires and already to have ordered the necessary machinery from America.

Editor's Book Table

BOOK REVIEW

"The Engineers' Illustrated Thesaurus." Herbert Herkimer. Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. Cloth, 5½ by 8 inches, 588 pages. Price, $6.

This valuable encyclopedia presents more than 8,000 classified illustrations of mechanical movements, machine parts, and machine details to help the engineer, designer, draftsman, and manufacturer select the machine parts or equipment most suitable for his special requirements. While many of the illustrations are accompanied with brief descriptions of functions, the book emphasizes the principles underlying machine design rather than structural details. Material covered includes fasteners; adjusting devices; supports and structures; basic mechanical movements; elevators, derricks, cranes, and conveyers; transmission of liquids and gases; combustion; prime movers; transportation; industrial processes; electrical appliances; and heating, cooling, and air conditioning. To assist in finding desired information, a thesaurus type of word classification is used; classifications of machine parts are plainly indentified, and there is a comprehensive subject index.

NEW PUBLICATIONS

"U. S. Electrical Wires and Cables for the Coal Mining Industry." United States Rubber Co., Rockefeller Center, New York 20, N. Y. 52 pages. This illustrated engineering catalog provides complete performance and specification data on wire insulation and jacket compounds portable cords, and cables rating up to 5,000 volts. Data are also given on shielded portable cables, welding cables, bore hole cables, mine power cables, and miscellaneous mine equipment.

"Reference Tables for Thermocouples." NBS Circular 508. Henry Shenker, John I. Lauritzen, Jr., and Robert J. Corruccini, National Bureau of Standards. 73 pages. For sale by the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. Price, $0.35. This circular gives expanded EMF-temperature reference tables for nine types of commercial thermocouples. The tables incorporate recent changes in electrical units and temperature scale, and millivolt reading for both Celsius and Fahrenheit scales are given.

"Symposium on Structural Sandwich Constructions." Special Technical Publication No. 118. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. 114 pages. $2. The eight significant papers and discussions comprising this publication were sponsored by ASTM Committee C-19 on Structural Sandwich Constructions and presented at the 1951 annual meeting of the Society. The papers, illustrated with numerous bibliographical references, charts, and graphs, should be of particular value to those responsible for the design and construction of aircraft, large buildings, houses, etc., as well as those concerned with aluminum, wood, adhesives, plastics, and fields of testing.

"Influence of Rubber Additions on Some Mechanical Properties of Asphaltic Bitumen." H. C. J. De Decker and H. A. W. Nijveld, Rubber Stichting, Delft, Netherlands. Reprint from "Proceedings of the Third World Petroleum Congress." E. J. Brill, publisher, Leiden, Holland. 9 pages. The influence of varying amounts of rubber to asphaltic bitumen and the use of different heating times at 170° C. in the preparation of the mixtures and the effects on the mechanical properties of these mixtures are recorded

"Witco Methylcyclohexyl Stearate." Technical Service Report E-2. Witco Chemical Co., 295 Madison Ave., New York 17, N Y. 1 page. Typical physical properties of methylcyclohexyl stearate, used in the rubber and the plastics industries as a plasticizer and of value in plasticizing chlorinated rubber as well as swelling both crude and vulcanized rubber, are given.

"Modern Hydraulic Presses." French Oil Machinery Co., Piqua, O. 26 pages. This new bulletin illustrates some of the various sizes and types of hydraulic presses built by this company within the last few years. A table of standard sizes of hot plate presses between 20 by 20 and 50 by 50 inches giving p.s.i. of platen area for various ram diameters and tonnage at 2000 p.s.i. is included together with a ram speed-pipe line flow chart and other useful tables.

"Analytical Studies Concerned with the Reactions between Organic Peroxides and Thio-Ethers. I. Analysis of Organic Peroxides. II. Analysis of Sulfoxides. III. Analysis of Mixtures of Peroxides and Sulfoxides." The British Rubber Producers' Research Association, Welwyn Garden City, England. Publications No. 151 and 152. 14 and 16 pages, respectively. These pages deal with some analytical problems concerned with the oxidation of organic sulfides, a subject of importance to the understanding of the aging of vulcanized rubber. In particular, the necessity has arisen for accurate methods for estimating hydroperoxides and sulfoxide groups, separately and together. Part I describes a method for hydroperoxides using stannous chlorides as reductant. Part II describes a reductometric method utilizing titanous chloride for sulfoxide; while Part III shows that a mixture of hydroperoxide and sulfoxide can be analyzed for each constituent by a suitable combination of both methods.

"The Vanderbilt News." Vol. 18, No. 2, March-April, 1952. R. T. Vanderbilt Co., 230 Park Ave., New York, N. Y. 64 pages. This issue of "The Vanderbilt News" is featured by a more-than-usual amount of material bringing up-to-date the company's work of past years on the subject of "Building a Rubber Compound." Sections are devoted to the background, objectives, processing steps and problems, etc. of modern rubber compounds. A tabular summary of Vanderbilt materials for rubber compounding and processing is included, together with practical compounds for use in specialized fields.

"Rubber's Return to the Western Hemisphere." Goodyear Tire & Rubber Co., Akron, O. 24 pages. This well-illustrated booklet reviews the history of the development of Goodyear's rubber plantations in Sumatra, the Philippines, and in Central America. Arguments for the establishment of a large-scale rubber plantation industry in Latin America, similar to those in a recent bulletin by P. W. Litchfield, chairman of the Goodyear board, in his "Notes on the American Rubber Industry" series, are a part of this new publication.

"Road Construction and Maintenance." Permanent International Association of Road Congresses. XI Congress—Lisbon, 1951. General Secretary's Office, 2 Rue Paul Cezanne, Paris, France. 36 pages. The last several pages of this report are a report by H. C. J. de Decker on "The Application of Rubber Powder in Asphalt Road Construction."

"Organic Chlorine Compounds." Carbide & Carbon Chemicals Co., 30 E. 42nd St., New York 17, N. Y. This new booklet describes the 11 organic chlorine compounds sold in commerical quantities by the company; their uses, physical properties, specifications, and shipping data. Also included in the booklet is a bibliography that lists the important references in the chemical literature to the organic chloride compounds discussed. The compounds are ethylene dichloride, propylene dichloride, trichlorethane, dichlorethyl ether, dichlorisopropyl ether, triglycol dichloride, n-butyl chloride, 2-ethylhexyl chloride, dichlorethyl formal, ethylene chlorhydrin, and propylene chlorhydrin.

"Statex 125 for Super Abrasion and Reinforcement." Binney & Smith Co., 41 E. 42nd St., New York 17, N. Y. 4 pages. Data on the use of Statex 125 in LTP GR-S treads and natural rubber treads are presented, including factory processing data in the No. 11 Banbury and the physical properties of tire factory extruded stocks. Outstanding wear (125% of HAF) and reinforcement in first-line passenger-car tires made with LTP GR-S are claimed for this new black.

Publications of Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. **"Fire Protection Equipment List."** January, 1952. 240 pages. **"Bi-Monthly Supplement to All Lists."** February, 1952. 72 pages. **"Lucky You."** The Travelers Insurance Cos., Hartford, Conn. 32 pages.

"Harflex Plasticizers for Vinyl Plastics." Hardesty Chemical Co., Inc., 41 E. 42nd St., New York 17, N. Y. Binney & Smith Co., at the same address, is distributer to the rubber industry. 20 pages. This bulletin provides much information on the use of Harchem plasticizers in vinyl chloride polymers and copolymer resins. Properties of these polymers containing the various plasticizers are listed in tables. Included are sections on general compounding, typical formulations, and test methods for evaluating plasticized vinyl films.

"Paracril—Standard Grades, Characteristics and Compounding." Technical Bulletin No. 1. Nauagatuck Chemical Division, United States Rubber Co., Naugatuck, Conn. 28 pages. This bulletin, the first of a planned series, presents a general description of the various Paracrils being produced together with information relating to applicable compounding methods and processing techniques. Information and data on some representative fillers, pigments, and plasticizers are also given. Tables show the effect of various loadings of MPC, SRF, MT, and HMF carbon blacks on the physical properties of Paracril B, and the data are further presented in the form of graphs. Similar treatment is given the data on plasticizer addition for dibutyl phthalate, BRT No. 7, and Cumar P-25.

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Plastic Pool

(*Continued from page 274*)

meet special requirements.

The portable cabana weighs only about 14 pounds and folds up into a package about the size of a suit box. The cabana is intended for a variety of outdoor purposes, including use as a dressing room at the seashore, as a shelter on hunting and fishing trips, and as a children's playhouse. The shelter has an inflatable eight-foot hexagonal base, with sides tapering up to a nine-foot sectional center pole. Alternate side panels have ventilation openings, and a seven-foot slide fastener of Vinylite permits the cabana to be opened or closed from both outside and inside. Each of the six sides of the base has an anchoring point and is separately inflatable by mouth or a tire pump. The plastic sheet floor is designed to reduce tipping, blowing over, or collapsing, and the hexagonal shape affords extra stability.

MARKET REVIEWS

CRUDE RUBBER

Commodity Exchange

WEEK-END CLOSING PRICES

Futures	Mar. 8	Mar. 15	Mar. 22	Mar. 29	Apr. 5	Apr. 12
Sept.	34.75	35.00	35.50	34.70	34.00	34.90
Dec.	32.40	33.25	33.00	32.80	32.35	33.40
Mar.	30.90	31.25	31.50	31.90	31.45	32.50
May	29.90	30.25	30.75	31.30	30.85	31.90
Total wkly. sales, tons	299	247	268	205	114	255

THE New York Commodity Exchange still lists rubber only for September, December, March, and May delivery, but trading has been confined almost exclusively to the first two months.

During the period March 15-April 15, the market was quiet to steady as the days advanced. Prices in general showed some rise. There were a little speculation and hedging and some factory buying plus commission house interest. The firm foreign rubber markets also proved a good influence.

The September position closed at 34.50¢ on March 17, hit the high for the period of 36.25¢ on March 19, then fluctuated within a narrow range to the low of 34.00¢ on April 4, and closed at 35.20¢ on April 15. December closed at 32.75¢ on March 17, the low of 32.35¢ on April 4, and the high of 34.15¢ on April 15.

Latices

IN HIS most recent report in the April *Natural Rubber News*, Arthur Nolan, of Latex & Rubber, Inc., indicates not much change in the *Hevea* latex situation. GSA is still in the driver's seat. Since the agency still holds stocks of the latex, as yet there is no "free" trading of this commodity in the nation. Any trading in private latex being done for May-June-July deliveries is subject to GSA authorization in accordance with M-2, as amended.

The government agency indicates it will maintain for its stocks of latex the price of 62.5¢ in rail tank cars.

May delivery "free" latex, however, has been going at about 49¢ a pound total solids, in bulk, rail tank cars.

Many Far Eastern estates, which had ceased latex preparation in favor of the more easily sellable solid rubber, have once more gone into the production of Hevea latex, but output is not currently at the rate of world consumption. Producers and importers are awaiting a clearer and truer picture of world demand before expanding output as many buyers are holding off on purchases until the lower priced "free" latex becomes available to them.

Other sources indicate that the General Services Administration said last month it expects to have sold out all remaining government stocks of natural latex about May 15. The National Production Authority has already announced that it will permit unregulated resumption of private importation of the material the moment GSA certifies that its stocks are liquidated.

RFC scheduled GR-S latex production at 2,880 long tons for April. Sales in March totaled 3,082 tons.

OPS has under consideration a minor amendment to its synthetic rubber order covering the reseller markup on smaller-than-tankcar quantity sales of GR-S latex. The existing regulation authorizes the seven or eight private firms that handle RFC's less-than-carload latex sales to add 1.5¢ a pound to a 26¢ government selling price. The amendment would continue the same 1.5¢ markup, but apply it to "the prevailing price"—lowered by RFC on March 8.

When GSA will be able to give NPA the nod to turn loose the reins on natural latex should be known with some finality after the May 9 meeting between the agency and its latex industry advisors. As of March 31, GSA held slightly in excess of 8,000 long tons of liquid latex. It figures on disposing of nearly 4,500 tons during April. May consumption is forecast at about 4,600 tons. Industry and the trade are expected to take all of the remaining GSA stocks in the first part of May; some of it for current consumption, and the balance to build up inventories to tide over consumers pending the arrival of privately ordered stocks. Private orders, subject to individual GSA licensing, were placed starting in February and should start arriving during May.

RECLAIMED RUBBER

MARCH was felt to be a good month for reclaimers. Tire manufacturers took much material for regular production and for second-line tires, as well as special material for the now-permitted white sidewalls. Battery container makers, who had been operating at about 50% capacity for some time, stepped up activity and ordered substantial quantities of reclaim.

The outlook for April was also considered good.

It is too early, according to one authority, to say just what effect on reclaim consumption the increasing production of oil-extended rubber will have. There is no question that this material is a threat to reclaim, but it is also felt that reclaim can be used economically with oil-extended rubber just as well as with non-oil rubber.

One manufacturer of reclaim on March 15 issued a new price list giving reductions on inner tube reclaims. Red tube reclaim is now quoted at 22¢; black, 16¢; while butyl was reduced to 13½¢.

SCRAP RUBBER

TOTAL business in the scrap rubber market last month was said to be much less than what one dealer ordinarily would have handled—and no end seems in sight for this lethargy. Prices naturally continued to decline, but now generally are regarded as nominal and not to be considered as the basis for any deals.

Export business still is hampered by lack of dollar exchange on the part of prospective buyers, and no improvement is seen here either.

OPS ceilings for scrap rubbber were given in our September issue, page 756. Following are dealers' actual selling prices for scrap rubber, in carload lots, delivered to mill at the points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$12.00	$14.50
S. A. G. auto tires	Nom.	Nom.
Truck tires	Nom.	18.00
Peelings, No. 1	Nom.	55.00
2	Nom.	28.00
3	Nom.	25.00
	(¢ per Lb.)	
Auto tubes, mixed	2.75	3.0
Black	3.0	3.5
Red	7.0	7.0
Butyl	2.75	2.75

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE
WEEK-END CLOSING PRICES

Futures	Jan. 26	Feb. 23	Mar. 22	Mar. 29	Apr. 5	Apr. 12
July	41.28	39.28	40.25	40.05	40.52	40.17
Oct.	38.82	36.63	37.29	37.13	37.52	37.77
Dec.	38.49	36.48	36.95	36.79	37.18	37.42
Mar.	38.35	36.38	36.83	36.25	37.02	37.20
May	38.15	36.23	36.57	36.42	36.80	36.93
July	37.69	35.84	36.15	36.01	36.37	36.40

TRADING on the New York Cotton Exchange was mostly moderate during the period March 17-April 17, with prices fluctuating within a narrow range. The spot cotton situation is considered tight and is expected to become more so as the season progresses

The spot price of 15/16-inch middling cotton was 42.30¢ on March 17, rose to 42.70 on March 19, fluctuated thereafter, dropping to 42.00¢ on March 27, then hitting a high of 43.05 on April 2, but dropping to the low for the period of 41.98¢ on April 17. Futures prices followed a similar trend. July was quoted at 40.10, 40.54, 39.90, 41.93, and 40.98¢ on the same dates.

Washington, as usual, made itself felt on the cotton market with its steel seizure and the resignation of Defense Mobilizer Charles Wilson; light to moderate mill and export price fixing; awards on various cotton cloths; proposed increased aid to cotton planters; cut in military funds by the House Appropriations Committee; and MSA grants to buy cotton, to Yugoslavia, $8,820,000, and to China (Formosa), $971,000.

Trading was curtailed because of the communications strikes and the religious holidays.

Other factors affecting the cotton market were: hedging and liquidation; weakness in other commodities; lag in domestic cotton goods trade; continued unfavorable advices from foreign textile markets; better rate of cotton consumption in February than had been anticipated; and lack of rain in some sections of the Cotton Belt.

The United States Department of Agriculture estimates domestic consumption of

cotton for the current season at 9½ million bales and exports at six million.

Domestic consumption for the first eight months of the season has been put at 6,212,700 bales, against 7,251,402 bales during the same period last year.

The Cotton Exchange reports exports for the season to April 14 at 4,701,453 bales, compared with 3,184,489 bales a year earlier.

Fabrics

During the period under review trading in industrial cotton goods was very slow, with only an occasional flurry in buying noted. Mill curtailments continued, and further cutbacks are anticipated in some cases. Some inquiry came from the coating and the automobile industries, but the threat of a steel strike is expected to nullify the latter interest.

Prices in many instances held at nominal figures or even declined. Consumer demand, it is believed, however, will improve in the second quarter when prices should firm.

Demand for duck was lagging although requests for Army bids proved an important factor in the market. Some business in hose and belting ducks and chafers also took place.

After weeks of comparative stagnancy, osnaburgs experienced a fairly good volume of sales, with more in prospect.

Prints also were a little stronger. In March they were sold ahead through the second quarter and into the third.

Prices in sheetings are down to about the lowest possible levels, based on cotton costs, with most mills selling well below cost. One large producer, therefore, cut production.

Cotton Fabrics

Drills		
58-inch 1.85-yd.	*yd.* $0.37	
2.25-yd.	.31	/ $0.32
Ducks		
38-inch 1.78-yd S. F.	*yd.* .38	
2.00-yd. D. F.	.32½	/ .34
51.5-inch, 1.35-yd, S. F.	nom.	
Hose and belting	.80	
Osnaburgs		
40-inch 2.11-yd.	*yd.* .26	
3.65-yd.	.165	
Raincoat Fabrics		
Print cloth, 38½-inch, 64-60		
[illegible]	yd. .145	
Sheeting, 48-inch, 4.17-yd	nom.	/ .2275
52-inch 3.85-yd.	nom.	
Chafer Fabrics		
14-oz./sq. yd. Pl.	*lb.* $0.84	/ $0.85
11.65-oz./sq. yd. S.	.76	
10.80-oz./sq. yd. S.	.78	/ .80
8.9-oz./sq. yd. S.	.815	
Other Fabrics		
Headlining, 68-inch 1.35-yd., 2-ply	*yd.* nom.	
64-inch, 1.25-yd. 2-ply	.69	
Sateens, 53-inch 1.32-yd.	.62	/ .63
58-inch 1.21-yd.	.67	/ .68
Tire Cords		
K. P. std., 12-3-3	*lb.* nom.	
12-4-2	.90	

Compounding Ingredients — Price Changes and Additions

Accelerator-Activators, Organic			
Dibenzo G-M-F	*lb.*	$2.50	
#113	*lb.*	.85	
Emery 600	*lb.*	.085	/ .115
G-M-F	*lb.*	2.50	
#117	*lb.*	.85	
Hyfac 430	*lb.*	.155	/ .1675
431	*lb.*	.165	/ .1775
Laurex	*lb.*	.26	/ .29
Vulklor	*lb.*	.75	/ .95
Stearic acid, rubber grade	*lb.*	.08	/ .0925
Accelerators			
Ethyl Tuex	*lb.*	1.00	
Naugets	*lb.*	1.00	
Antioxidants			
B-X-A	*lb.*	.49	/ .58
Blowing Agents			
Celogen	*lb.*	2.20	
Carbon Black—HAF			
Kosmos 60/Dixie 60	*lb.*	.075	/ .1175
Colors			
White			
Zinc oxide, commercial			
Lehigh—35%	*lb.*	.176	/ .196
50%	*lb.*	.1775	/ .1975
Plasticizers and Softeners			
Baker AA oil	*lb.*	.29	/ .35
Crystal O oil	*lb.*	.305	/ .365
Processed oils	*lb.*	.31	/ .345
Reinforcers Other Than Carbon Black			
Kralac A	*lb.*	.43	/ .54
Retarders			
E-S-E-N	*lb.*	.34	/ .36
Synthetic Rubbers and Latices			
Paracril Dry Rubbers			
18-80	*lb.*	.60	/ .61
AJ	*lb.*	.485	/ .495
B	*lb.*	.50	/ .51
BJ	*lb.*	.50	/ .51
BV	*lb.*	.51	/ .52
C	*lb.*	.58	/ .59
CS or VC	*lb.*	.59	/ .60

RAYON

PRODUCTION in the United States during March of viscose high-tenacity yarn continued at or near capacity levels, although the overall production of rayon during the month was cut back even further from February levels. Total shipments also declined for March. Domestic shipments for the first quarter of 1952 also were below the figure for the 1951 period.

The annual capacity of the viscose high-tenacity yarn producing industry is expected to reach 433 million pounds by the third quarter of this year, largely owing to the number of new spinning nozzles installed, or being installed, and to the conversion of regular-tenacity filament yarn capacity. By next spring an annual capacity of 473 million pounds of high-tenacity viscose yarn is anticipated, and by the end of 1953, 504 million pounds.

A recent survey indicates that last year consumption of wool, cotton, rayon, and acetate for military purposes totaled 615 million pounds, or 9% of the total consumption of these fibers. Of this figure 60 million pounds of high-tenacity viscose rayon yarn were used by the military, principally for tires, to absorb 18% of the total shipments of this yarn to tire manufacturers last year.

The following figures indicate the trend in U. S. exports of viscose tire cord and yarn and cord-tire and fuel cell fabrics in recent years:

	Tire Cord and Yarn		Cord-Tire and Fuel Cell Fabrics	
Year	Units*	Value†	Units‡	Value†
1948..	4,855	$2,945	29,947	$14,767
1949..	5,361	3,166	35,989	18,060
1950..	3,932	2,324	30,059	14,126
1951..	2,600	1,677	27,263	13,620

*In thousands of pounds.
†In thousands of dollars.
‡In thousands of square yards.

The table below shows current prices for rayon tire fabric and yarns.

Rayon Prices

Tire Fabrics		
1100/490/2		$0.72
1650/980/2	$0.695	/ .73
2200/980/2		.685
Tire Yarns		
1100/ 480		.63
1100/ 490		.62
1150/ 490		.62
1650/ 720		.62
1650/ 980		.61
1900/ 980		.61
2200/ 960		.61
2200/ 980		.60
4400/2934		.63

United States Rubber Statistics—January, 1952

(All Figures in Long Tons, Dry Weight)

	New Supply			Distribution		Month-End Stocks
	Production	Imports	Total	Consumption	Exports	
Natural rubber, total	0	80,561	80,561	32,701	140	77,542
Latex, total	0	2,569	2,569	4,075	0	4,085
Rubber and latex, total	0	83,130	83,130	36,776	140	81,627
Synthetic rubbers, total	†68,601 ‡6,613	1,280	76,494	69,430	1,803	137,785
GR-S types*	†60,702 ‡16	1,015	61,733	57,646	74	111,074
Butyl	†7,899	265	8,164	5,942	0	15,289
Neoprene*	‡5,344	0	5,344	4,693	1,379	7,637
Nitrile types‡	‡1,253	0	1,253	1,149	350	3,785
Natural rubber and latex, and synthetic rubbers, total	75,214	84,410	159,624	106,206	1,943	219,412
Reclaimed rubber, total	25,755	100	27,855	26,553	958	45,067
GRAND TOTALS	100,969	84,510	187,479	132,759	2,901	264,479

SOURCE: Rubber Division, NPA, United States Department of Commerce, Washington, D. C.
*Includes latices.
†Government plant production.
‡Private plant production.

Trade Lists Available

The Commercial Intelligence Division has recently published the following trade lists of which mimeographed copies may be obtained by firms domiciled in the United States from this Division and from Department of Commerce Field Offices. The price is $1 a list for each country.

Automotive Vehicle & Equipment Importers & Dealers: Costa Rica, Sweden.

Automotive Product Manufacturers: Brazil, Israel.

Chemicals Importers & Dealers: Guatemala.

Electrical Supply & Equipment Importers & Dealers: France, Turkey, Uruguay.

Plastic Material Manufacturers, Molders, Laminators & Fabricators of Plastic Products: Egypt, Italy, Norway, Spain.

Rubber Goods Manufacturers: Republic of Ireland.

Rubber Goods Manufacturers & Exporters: Pakistan.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

Effective July 1, 1947

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.25 per line (ten words)	Light face type 40c per line (ten words)	Light face type $1.00 per line (ten words)
Bold face type $1.60 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.40 per line (eight words)

Allow nine words for keyed address.

Letter replies forwarded without charge, but no packages or samples.

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS WANTED

PRODUCTION MANAGER OR GENERAL MANAGER: MAN with over 20 years' experience in production, management, testing and compounding natural and synthetic rubber for specification molded goods and mechanicals. Recent experience high-temperature high-speed molding. Practical, energetic, possesses initiative, organizational ability, can handle personnel. Proven record of performance. Address Box No. 1017, care of INDIA RUBBER WORLD.

PRACTICAL MAN CAPABLE OF TAKING CHARGE OF SMALL plant. Versed in compounding, production, maintenance, and buying. Factory superintendent of custom molding plant for past eight years. Midwestern or western connections preferred, but will consider other locations. Married. Address Box No. 1018, care of INDIA RUBBER WORLD.

RELIABLE CHEMIST, B.S., TO ASSIST A BUSY CHIEF CHEMIST who wants to rely on an experienced and adaptable assistant in the development of adhesive problems. Pressure-sensitive adhesives, tapes, laminating cements, adhesives from any rubber, from polymers, from vinylites, from cellulose lacquers. Coatings of diverse types, quarter-linings. Emulsions. Factory, laboratory experience. Practical minded. Salary according to responsibilities. Present salary $400 per month. Will go anywhere. Address P. O. Box 1185, Oakland, Calif.

IF YOU CAN USE A TOP-GRADE PRODUCTION SUPERVISOR and latex compounder with an excellent record, send for resume to Box No. 1041, care of INDIA RUBBER WORLD.

PRODUCTION MINDED RUBBER & PLASTICS CHEMIST, Chem. Engineer, compounder. Eight years' research, development, production, quality control, technical service, supervision, technical director experience. Mechanical goods, molded and extruded, natural and synthetic, emphasis oil and solvent-resistant stocks and coatings. Compounding to ASTM, Military, and Automotive Specifications, and special customer requirements. Phi Beta Kappa, 33, married, child, veteran, draft-exempt. Address Box No. 1042, care of INDIA RUBBER WORLD.

LATEX CHEMIST. DIP-PLANT MANAGER FOR ELEVEN years. Special interest in research and development. Address Box No. 1044, care of INDIA RUBBER WORLD.

RUBBER CHEMIST, ELEVEN YEARS. EXPERIENCED DRY rubber, reclaim, plastisol. Expert in latex. Supervisory or compounding. New Jersey-New York area. Address Box No. 1045, care of INDIA RUBBER WORLD.

EXECUTIVE—RUBBER ENGINEER DESIRES TO RELOCATE, capable as factory manager or technical director. Over 20 years' technical-practical experience manufacturing mechanical rubber and sponge rubber products. Experienced in all phases of the processes. Job contracts considered. Address Box No. 1046, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

SALES TRAINEES

If you want to be a rubber chemicals salesman, are not over 26 years old, and have two years or more of training or experience in rubber compounding beyond a bachelor's degree in chemistry or chemical engineering, we would like to have you send us your photo and a résumé. We are a prominent manufacturer of organic chemicals and are expanding our sales force. Men selected will be trained in our plant and laboratories and in our sales offices before being assigned to actual selling. Address Box No. 1019, care of INDIA RUBBER WORLD.

WANTED IN ISRAEL, RUBBER EXPERT FOR DIRECTION of small research and development laboratory. Application with full particulars, reference and salary to Israel Rubber Research Association. Address Box No. 1020, care of INDIA RUBBER WORLD.

PRODUCTION CHEMIST WITH LABORATORY AND FACTORY experience on molded, solid, and sponge rubber industrial parts. Send résumé. Our technical staff know of this ad. Good salary and opportunity. Address Box No. 1021, care of INDIA RUBBER WORLD.

EXPERIENCED LATEX CHEMIST FOR TECHNICAL SALES work in fields already developed. Exceptional opportunity for right man. State experience in detail in first letter. Address Box No. 1022, care of INDIA RUBBER WORLD.

SITUATIONS OPEN (Continued)

RUBBER CHEMIST

Excellent opportunity for research development, and technical service in the utilization of reinforcing fillers, resins and other compounding ingredients. Must have considerable experience in tire manufacture. Old established manufacturer, modern research facilities, excellent working conditions. Salary open. Write, giving academic, personal and work history.

Address Box No. 997, % INDIA RUBBER WORLD

CHEMIST TO HEAD NEW CHEMICAL PRODUCTION control department. Experience in rubber compounding essential. Evaluation of production rubber insulating compounds, magnet wire insulation and production control. Excellent opportunity for aggressive chemist. Contact THE ELECTRIC AUTO-LITE, WIRE AND CABLE DIVISION, Port Huron, Mich., for appointment, advising salary requirements.

RUBBER CHEMIST TO TAKE CHARGE OF LABORATORY, compounding and development in medium sized factory in New England manufacturing rubberized fabrics, thread, and adhesives. Excellent opportunity and permanent position. State experience, age, and salary requirements in reply. Address Box No. 1023, care of INDIA RUBBER WORLD.

RUBBER CHEMICALS RESEARCH CHEMIST: UNUSUAL opportunity for organic or physical chemist with experience in rubber technology for original research on application of chemicals in natural and synthetic elastomers; additional experience in polymerization desirable.

QUALIFICATIONS: Strong background in organic and/or physical chemistry, rubber compounding experience (including knowledge of evaluation methods), ability to organize and supervise research of others in group, ability to handle outside research contacts.

LOCATION: Organic Chemicals Division Research Department, Nitro, West Virginia (Charleston). New Laboratory. Submit résumé of background and experience to: Personnel Department, MONSANTO CHEMICAL COMPANY, 1767 South Second Street, St. Louis 4, Missouri.

RUBBERIZED PONTOONS AND BOATS ENGINEER AND PRODUCTION SUPERVISOR WANTED

Experienced man required.

Address Box No. 1038, c/o INDIA RUBBER WORLD

WANTED: MAN THOROUGHLY EXPERIENCED TO TAKE complete charge of rubberized hair plant located in southern Florida. Good position, good pay. Must know manufacturing end in all its phases. Address Box No. 1024, care of INDIA RUBBER WORLD.

CHEMICAL ENGINEER: WELL-ESTABLISHED RUBBER COMPANY requires the services of a chemical engineer for research development. One to two years' experience in the rubber industry is desirable. Location of company in New York State. Please submit personal résumé in first letter. Address Box No. 1025, care of INDIA RUBBER WORLD.

RUBBER TECHNICIAN: NORTH CAROLINA BRANCH PLANT of a nationally known concern has opening in Technical Department for a chemical engineer with three to five years' experience in development and manufacture of mechanical goods. Must know compounding and factory processing. Work involves responsibility for quality control and comprehensive reporting of laboratory results. Good opportunity for progress upon demonstration of ability. Excellent living conditions. Outline personal history, education, and experience. Indicate salary required. Address Box No. 1026, care of INDIA RUBBER WORLD.

(Classified Advertisements Continued on Page 297)

U. S. Imports, Exports, and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	December, 1951 Quantity	December, 1951 Value
UNMANUFACTURED, Lbs.		
Crude rubber	99,305,264	$42,695,898
Latex	1,926,066	1,190,609
Guayule	383,600	110,448
Balata	215,459	113,773
Jelutong	116,345	99,761
Gutta percha	18,046	23,467
Reclaimed rubber	33,600	2,268
Scrap rubber	1,876,828	92,558
Synthetic rubber	2,010,002	541,089
TOTALS	105,885,210	$44,869,871
MANUFACTURED		
Tires and casings		
Auto, etc. *no.*	4,356	$120,613
Bicycle *no.*	1,243	1,208
Other *no.*	68	1,587
Inner tubes, auto, etc. *no.*	232	651
Rubber boots *prs.*	4,339	17,898
Shoes and overshoes *pr.*	17,765	11,694
Soled shoes fabric uppers *pr.*	3,027	1,421
Heels and soles *lbs.*	23	52
Balls, golf *no.*	1,440	415
Tennis *no.*	2,880	521
Other athletic *no.*	1,654	2,114
Toys, other	.....	26,371
Combs *gr.*	17,543	1,814
Hard rubber goods	.....	68,027
Rubberized printers' blankets *lbs.*	492	1,145
Rubber and cotton packing *lbs.*	5,500	11,301
Packing and gaskets	.....	1,772
Molded insulators, etc.	.....	3,024
Bands *lbs.*	2,848	2,926
Belts, machine *lbs.*	28,522	23,996
Hose	.....	1,566
And tubing, other	.....	6,007
Drug sundries *prs.*	7,321	1,828
Nipples and pacifiers *gr.*	375	392
Instruments *doz.*	8,861	3,447
Products, other	.....	546
Gutta percha manufactures *lbs.*	6,501	5,203
Synthetic rubber articles	.....	8,929
Soft rubber manufactures	.....	42,944
TOTALS	.....	$369,412
GRAND TOTALS, ALL RUBBER IMPORTS	.....	$45,239,283

Exports of Domestic Merchandise

	December, 1951 Quantity	December, 1951 Value
UNMANUFACTURED, Lbs.		
Synthetic rubbers		
Buna N	559,899	$295,148
S	39,514	18,016
Neoprene	2,578,823	1,079,332
"Thiokol"	500	218
Polyisobutylene	2,027	933
Other	21,802	22,869
Reclaimed rubber	2,293,146	208,565
Rubber scrap	2,274,608	101,077
TOTALS	7,770,319	$1,726,158
MANUFACTURED		
Rubber cement *gal.*	65,716	$168,865
Rubberized fabric		
Auto cloth *sq. yds.*	17,767	25,093
Piece goods and hospital sheeting *sq. yds.*	51,492	52,507
Rubber boots *pr.*	11,061	53,585
Shoes *pr.*	9,280	27,469
Soled canvas shoes *pr.*	11,483	23,648
Soles *doz. pr.*	23,761	83,878
Heels *doz. pr.*	54,201	65,493
Soling and toplift sheets *lb.*	546,506	117,740
Gloves and mittens *doz. pr.*	21,371	87,723
Water bottles and fountain syringes *no.*	13,949	12,380
Drug sundries, other	.....	175,074
Or rubberized clothing	.....	85,086
Toy and novelty balloons	.....	35,136
Toys and balls	.....	37,579
Erasers, except pencil *lb.*	24,079	19,882
Hard rubber battery boxes *no.*	40,147	58,838
Electrical goods, other *lb.*	126,247	90,201
Combs, finished *doz.*	2,422	3,607
Other	.....	29,533
Tires and casings		
Truck and bus *no.*	132,375	7,206,555
Auto *no.*	77,234	1,225,281
Aircraft	.....	121,342
Farm tractor, etc. *no.*	10,687	433,665
Bicycle *no.*	19,944	32,177
Motorcycle *no.*	361	3,556
Other *no.*	7,040	70,442
Inner tubes, auto *no.*	45,313	95,340
Truck and bus *no.*	98,633	509,903
Aircraft *no.*	1,391	10,839
Other *no.*	22,594	102,706
Tires, solid, truck and industrial *no.*	$2,215	$47,858
Tire repair materials		
Camelback *lb.*	636,002	224,927
Other *lb.*	426,667	387,922
Rubber and friction tape *lb.*	72,766	56,908
Belting		
Auto and home *lb.*	111,848	163,268
Transmission		
V-belts *lb.*	120,127	261,704
Flat belts *lb.*	57,931	101,819
Other *lb.*	45,588	49,344
Conveyor and elevator *lb.*	220,388	155,602
Other *lb.*	564	2,417
Hose and tubing *lb.*	813,974	773,584
Packing *lb.*	247,952	269,677
Mats, flooring, etc. *lb.*	598,518	202,417
Thread, uncovered *lb.*	3,811	6,735
Textile covered *lb.*	11,604	54,213
Gutta percha manufactures *lb.*	5,429	9,507
Latex, compounded, and other rubber for further manufacture *lb.*	501,723	250,721
Other natural and synthetic rubber manufactures	.....	546,849
TOTALS	.....	$14,630,595
GRAND TOTALS, ALL RUBBER EXPORTS	.....	$16,356,753

Reexports of Foreign Merchandise

	December, 1951 Quantity	December, 1951 Value
UNMANUFACTURED, Lbs.		
Crude rubber	56,489	$22,732
Balata	18,266	10,930
Rubber scrap	224	168
TOTALS	74,979	$33,830
MANUFACTURED		
Rubber toy and novelty balloons	.....	$216
Toys and balls	.....	1,911
Erasers, except pencil *lb.*	850	300
Tires and casings		
Truck and bus *no.*	60	1,981
Farm tractor, etc. *no.*	28	1,423
Other natural and synthetic rubber manufactures	.....	288
TOTALS	.....	$6,119
GRAND TOTALS, ALL RUBBER REEXPORTS	.....	$39,949

SOURCE: Bureau of the Census, United States Department of Commerce, Washington, D. C.

Estimated Automotive Pneumatic Casing and Tube Shipments, Production, Inventory; February, January, 1952; February, 1951

Passenger Casings	Feb., 1952	% of Change from Preceding Month	Jan., 1952	First Two Months, 1952	First Two Months, 1951
Shipments					
Original equipment	1,806,225		1,659,754	3,465,979	5,193,872
Replacement	3,061,721		3,392,875	6,454,596	5,381,665
Export	52,887		56,791	109,678	100,902
TOTAL	4,920,833	− 3.69	5,109,420	10,030,253	10,676,439
Production	5,990,618	− 4.39	6,265,423	12,256,041	10,131,076
Inventory end of month	9,180,348	+13.76	8,069,652	9,180,348	2,506,974
Truck and Bus Casings					
Shipments					
Original equipment	494,772		480,245	975,017	844,626
Replacement	658,791		849,971	1,508,762	1,486,801
Export	109,999		89,355	199,354	127,717
TOTAL	1,263,562	−10.99	1,419,571	2,683,133	2,459,144
Production	1,472,381	− 8.34	1,606,269	3,078,650	2,520,017
Inventory end of month	2,189,978	+11.22	1,969,115	2,189,978	800,064
Total Automotive Casings					
Shipments					
Original equipment	2,300,997		2,139,999	4,440,996	6,038,498
Replacement	3,720,512		4,242,846	7,963,358	6,868,466
Export	162,886		146,146	309,032	228,619
TOTAL	6,184,395	− 5.28	6,528,991	12,713,386	13,135,583
Production	7,462,999	− 5.19	7,871,692	15,334,691	12,651,093
Inventory end of month	11,370,326	+13.26	10,038,767	11,370,326	3,307,038
Passenger (Including Motorcycle and Truck and Bus Tubes					
Shipments					
Original equipment	2,288,523		2,143,822	4,432,345	6,046,360
Replacement	2,551,301		3,231,808	5,783,109	6,337,073
Export	118,557		99,257	217,814	137,445
TOTAL	4,958,381	− 9.44	5,474,887	10,433,268	12,520,878
Production	5,138,342	− 7.95	5,581,856	10,720,198	11,109,623
Inventory end of month	10,506,748	+ 1.59	10,342,795	10,506,748	5,169,501

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

Foreign Trade Opportunities

The firms and industries listed below recently expressed their interests in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, Washington, D. C., or through its field offices, for $1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Export Opportunities

Pinchen & Young (Pty.) Ltd., P. O. Box 13, Durban, Union of South Africa: sporting goods.

Casa Italiana Scambi Con L'Estero, 132 Corso Alfieri, Asti, Italy: plastics, synthetic rubber.

International Supply Center, 18 Rue Moliere, Tangier, Morocco: sporting goods.

D. S. Alexander, 18 Union Bldg., Mark Lane, Durban, Union of South Africa: rubber, chemicals.

S. P. R. L. "UNICA," Anc. Ets. Jos. Verhoye-Deckmijn & Fils, 68 Blvd. Vandenpeereboom, Courtrai, Belgium: varnishes for latex toys.

Michel J. Zaidan, representing El Alamia, 18 Soliman Pasha St., Cairo, Egypt: automotive accessories, tires, service station and workshop equipment.

Import Opportunities

Societe Bordelaise de Matieres Plastiques, 156 Rue des Orangers, Caudéran, Gironde, France: bottle crowns and droppers and nursery bottle nipples.

Fratelli Battistini, Via Paradiso 1, Forli, Italy: rubber shoes and felt slippers with rubber soles.

SITUATIONS OPEN (Continued)

ADHESIVE CHEMIST. RAPIDLY GROWING OHIO COMPANY needs chemist interested in research and development on all types of adhesives. Ability to work independently of prime importance. All replies held strictly confidential. Please give details of professional and academic experience, past earnings, personal data, etc., in first reply. This is an exceptional opportunity for someone with initiative to build a career. Address Box No. 1027, care of INDIA RUBBER WORLD.

ADHESIVES CHEMIST: TO WORK EXCLUSIVELY IN RESEARCH and development of adhesives in laboratory of progressive Midwest compounding company. Experience in natural and various latices required. Ability to work independently of prime importance. Reply in confidence giving details of academic and professional experience, salary range desired, and age. Address Box No. 1028, care of INDIA RUBBER WORLD.

FOREMEN

For various departments of plastic sheeting plant. Must be experienced. Reply giving full details and salary wanted. Address Box No. 1029, care of INDIA RUBBER WORLD.

PRODUCTION MANAGER

For vinyl sheeting factory. Must be experienced. State experience and salary desired. Address Box No. 1030, care of INDIA RUBBER WORLD.

SALES REPRESENTATIVE WANTED—PHENOLIC RESINS. Willing to make commission arrangement if so desired. Our men have been advised about this advertisement. Address Box No. 1043, care of India RUBBER WORLD.

MACHINERY AND SUPPLIES FOR SALE

LIQUIDATING RUBBER PLANT

Still set up in original operating position: 1—Allen 60" heavy-duty Rubber Mill, enclosed reduction unit and 50 HP synchronous motor. 10—Bolling 18" x 18" 5-opening Hydraulic Presses, 10" ram. 2—Adamson 24 x 24 2-opening Hydraulic Presses, 12" ram. 15—Hydraulic Lift Tables, 24" x 42" platforms. 1—Accumulator, weighted type, 2300#, 5½" ram.

PHONE — WIRE — WRITE
CONSOLIDATED PRODUCTS COMPANY, INC.
13-16 Park Row, New York 38, N. Y. BArclay 7-0600

FOR SALE: NEW LABORATORY MILLS AND CALENDERS, Banbury Mixers, Mills, Calenders, Laboratory Mill and Banbury Unit, Extruders, Tubers, Hydraulic Presses. Send for detailed bulletin. EAGLE INDUSTRIES, INC., 110 Washington Street, New York 6, N. Y. DIGBY 4-8361-5-6.

FOR SALE: 50" CALENDER, THREE 18" ROLLS, 12" NECK, complete with 50 h.p. 220-volt motor and controls—$3500. Address Box No. 1033, care of INDIA RUBBER WORLD.

FOR SALE: 2 KUX ROTARY PELLET PRESSES MODEL 25, 21-punch and 25-punch. 6 Stokes Rotary Pellet Presses, 16-punch, models B-2, D-3, and D-4. Large stock Stainless Steel Tanks from 6 gal. to 5,700 gal. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila. 22, Pa.

FOR SALE: FARREL 4-ROLL CALENDER, 20 x 60, VERTICAL stack, herringbone cut steel gears, friction and even motion drive, complete with reduction gear unit, 2 new spare rolls. Immediately available, can be seen running. Address Box No. 1034, care of INDIA RUBBER WORLD.

BANBURY BODIES FOR INTERCHANGE—BODIES FOR #9 and #11 Banburys, completely rebuilt, with door and cylinder. Interchange for your worn body with little lost time. We rebuild all sizes of Banburys and have or can fabricate parts. Our Banbury rebuilding service has been perfected through 17 years' specialized experience. For details and prices write INTERSTATE WELDING SERVICE, Offices, Metropolitan Bldg., Akron 8, Ohio.

(Classified Advertisements Continued on Page 298)

CLASSIFIED ADVERTISEMENTS

Continued

MACHINERY AND SUPPLIES FOR SALE (Continued)

FOR SALE: 1 SCOTT TESTER—MODEL L 3, 50- to 250-LB. capacity with 1/4 h.p. motor. Good operating condition. Address Box No. 1035, care of INDIA RUBBER WORLD.

FOR SALE: FARREL 16" x 48" AND 15" x 36", 2-ROLL RUBBER mills, also new Lab. 6" x 12" & 6" x 16" mixing mills and calenders, & other sizes up to 84". Rubber Calenders. Extruders 1" to 3". Proctor & Schwartz 6-fan, 3-apron Conveyor Dryer. Baker-Perkins Mixers 200 & 9 gal., heavy-duty double-arm. Ball & Jewell & Leominster Rotary Cutters. Large stock Hydraulic Presses from 12" x 12" to 48" x 48" platens, from 50 to 1500 tons. Hydraulic Pumps and Accumulators. Crushers, Churns, Rubber Bale Cutters, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT CO., 90 WEST STREET, NEW YORK 6, N. Y.

FOR SALE: ONE 30" x 30" STANLEY HOLMES SPONGE RUBber press. Practically new. Address Box No. 1039, care of INDIA RUBBER WORLD.

FOR SALE: 1 STEWART BOLLING HOT PRESS, 4 PLATEN hydraulic, platen 20 x 54 with 3" openings, 12" ram diameter. Maximum pressure 2100, complete with hydraulic unit. One Stewart Bolling Cold Press, 5 platen hydraulic, platen 24 x 54 with 3" openings, 12" ram diameter. Maximum pressure 1100, complete with hydraulic unit. Address Box No. 1040, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

WANTED—TO EXPEDITE PRODUCTION—RUBBER MAKING machinery including Banbury Mixers, Heavy-Duty Mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a set-up plant now operating or shut down. When offering, give full particulars. P. O. Box 1351, Church Street Sta., New York 8, N. Y.

WANTED: 1—2-ROLL, 30" RUBBER MILL, ROLL SPEED NOT to exceed 1.5, good condition, with or without drive. Within 500-mile range. Address Box No. 1036, care of INDIA RUBBER WORLD.

ONE STEAMHEATED PRESS—PLATENS 30" x 30" WITH A 14" ram and 24" of daylight. ASSOCIATED RUBBER, INC., Box 61, Quakertown, Pa.

WANTED: HYDRAULIC PRESS, 40" x 40" or 42" x 42" STEEL platens, 36" diameter ram, 8 openings. Write P. O. Box 8, Hagerstown, Maryland.

WE ARE INTERESTED IN PURCHASING ALL TYPES OF RUBber machinery consisting of mills, Banbury mixers, extruders, calenders, vulcanizers, etc., and also complete plants. Address Box No. 1037, care of INDIA RUBBER WORLD.

SMALL VULCANIZER 12" TO 18" DIAMETER BY APPROXImately 2 feet long. Tested for 40 lbs. operating pressure. ASSOCIATED RUBBER, INC., Quakertown, Pa.

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RUBBER TECHNOLOGIST WANTS TO ENTER PARTNERSHIP through investment of capital on a small- or medium-size rubber plant. Address Box No. 1031, care of INDIA RUBBER WORLD.

ACTIVE PARTNER WANTED TO ESTABLISH A RUBBER products manufacturing company in the Akron-Cleveland area. Should have a minimum of $5,000 and experience in manufacturing rubber molded goods. Address Box No. 1032, care of INDIA RUBBER WORLD.

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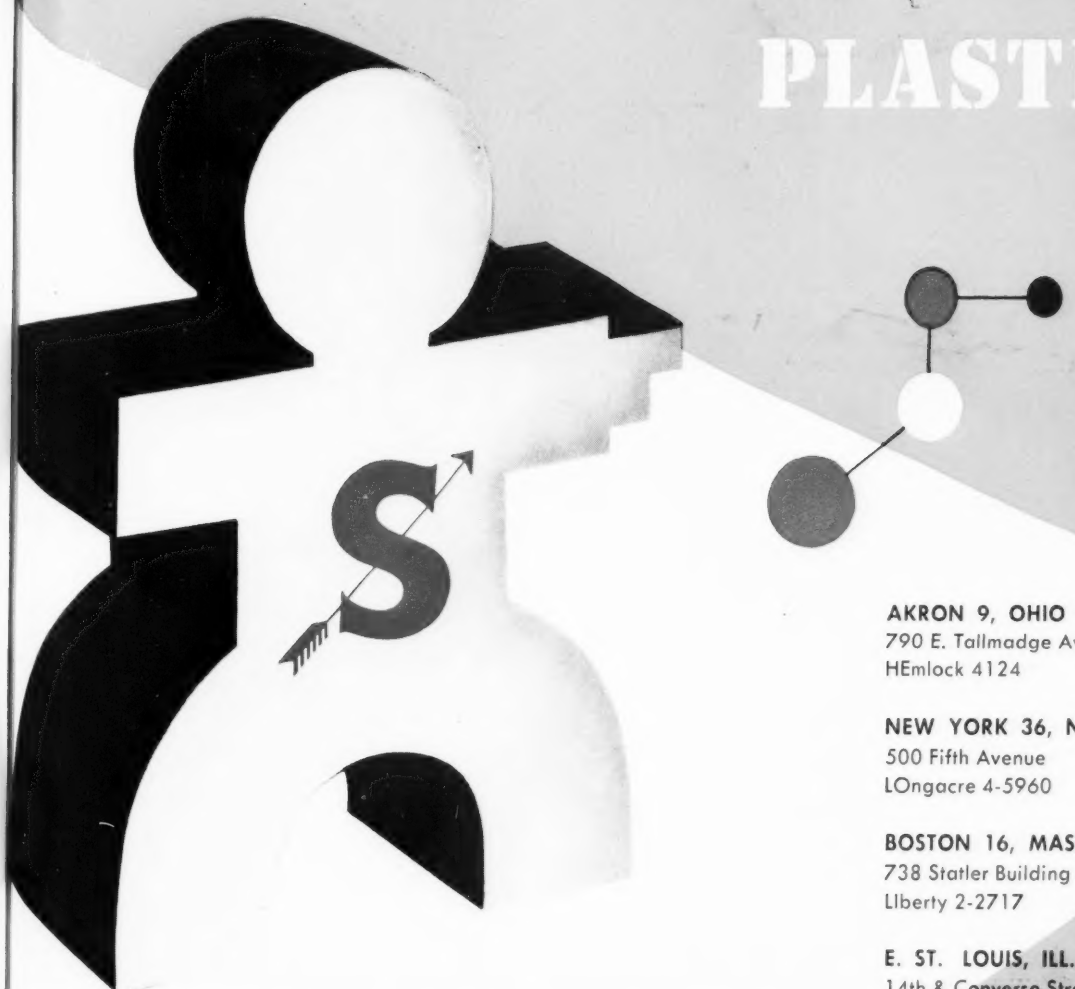

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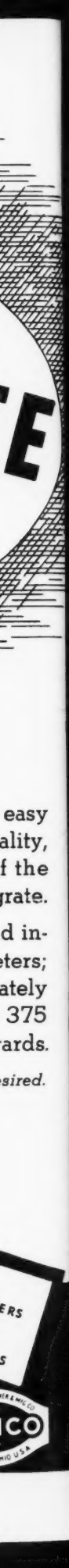
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